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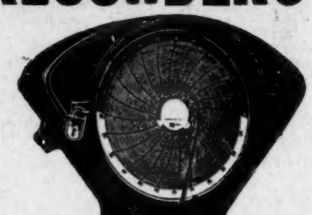

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GAS JOURNAL

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VOL. CXXXVII., No. 2809.] TUESDAY, MARCH 13, 1917. [69TH YEAR.

EDITORIAL NOTES.

The Call to Higher Efficiency.

IN the midst of the gravest difficulties with which the gas industry has had to contend, there is a cheerfulness as to the future that is of good omen. This is seen especially among the technical men—the men who are more capable of judging prospects than the man who estimates the future by current prices and profits, or the man who makes observation with a depression upon him engendered by prevailing circumstances. The reason for the cheerfulness is that it is known that the difficulties that obsess are only temporary, and that the war has substantially expanded the vista of the industry. We see the industry fitting itself with accuracy and an indispensability into the new national life that the war has created, and we see it, too, through the inherent virtues of its operations and products, filling a larger place than the most sanguine expectations of the past had allocated to it. Among those who view the prospect with considerable cheerfulness is Mr. W. N. Westlake, of Exeter, the new President of the Southern District Association of Gas Engineers and Managers. His Presidential Address last Thursday was the product of clear observation and deduction; and it was presented with just those colours that are not an under nor an over estimate of what is appropriate in the circumstances. It looked at the present position, it presented requirement, it urged that all should pull together to give to the industry its maximum strength and raise it to its proper position—not only that it may (as the President puts it) help the cause of national recuperation and reconstruction, but so that it may take a larger measure of prosperity from its opportunities to its own benefit and that of the consumers of its primary commodity.

The men of the gas industry are far from being infallible; the industry itself is far from being perfect in its operations. But they and it do claim that the war did not find them unprepared to aid the country in a very material and vital manner, though the country was unprepared to reciprocate by ensuring to the industry some service, in relation to the provision of raw material, in manner that would at any rate have secured to it a fair financial return for its capital and work. The time, however, has passed for reproach against high authority with power to assist, but did not except reluctantly to aid temporarily in the matter of coal deliveries, while doing nothing at all, through effective coal control and freights regulation, to stem in some directions a headlong shrinkage of gas dividends. Over none of these matters the President stops. The more important thing is, while meeting all present conditions, to also find time to examine the future in the light of current events and developments. And as he shows, introspection reveals that there are places in our industrial system that require repair and renewal, and in some respects of a very drastic order, if the units of the industry are to move forward in a common line, and exercise a common influence to the same ends. His call, summed up, is for a greater and a more universal efficiency; and he applies the call to himself and others—not setting Exeter up as a pattern, although not hesitating to claim for it a share, and it is a really good share, in the essential work which has for its objective a bigger place in national life and service. Greater efficiency means that we are to shake off the fetters of the past that were forged by the spirit of self-sufficiency, which is a dangerous characteristic. The hoped-for development can only be achieved by a liberal introspection, by a revision of methods, by making the utmost use of the disclosures forced upon us by war conditions, and by scientific collaboration in the promotion of efficiency and improved process, and in the maintenance of the very highest attainable standards.

There is much work to be done in this way, and it must be done in order to meet what the President describes as the "critical period" that is approaching. There is the question of fuel economy. Mr. Westlake shows by official data that the gas industry has been in its own interests—interests served by a cheapening of production and selling at a lower price—helping forward fuel economy, long before the campaign was set in motion, and long before the Government saw in it a matter of such vital national importance as to require its intervention and protection. Mentioning that the gas industry carbonizes at present some 18 million tons of coal per annum, he says that it is its duty to see that this large quantity is used to the best advantage. To the gas industry, "fuel economy" has a meaning, and possesses an encouragement, extending much beyond that. It is hoped that its duty will be not only to see that this large quantity is used to the best advantage, but a larger quantity still diverted from wasteful usage in the domestic grate and in the industrial furnace. The President indicates by average figures how the gas industry has been saving coal in the past decade—some 1½ million tons—by increasing the production of gas per ton carbonized. The average in 1914 was 11,645 c.ft. The gas industry congratulates itself upon this; but averages are always cloaks that screen the good from admiration, the bad from reproof. The 11,645 c.ft. means that there are many undertakings above this production, and many inferior to it; so that the figure in itself is no standard for good working. On four months' operation of his new vertical retorts, Mr. Westlake obtained an average gas yield, with a mixture of Somerset and Yorkshire coals, of 14,024 c.ft., which is 2379 c.ft. per ton greater than the average of statutory gas undertakings for the year 1914. There is thus room elsewhere for further fuel economy using similar quality coals, whether to the extent represented by the 14,024 c.ft. could better be judged by an analysis of the gas. But Mr. Westlake urges that a great advance could be made in coal conservation in the industry by a drastic scrapping of inefficient carbonizing plant; and confessedly there are not a few cases where this could be done, new money be spent, and yet a financial economy be effected. The address incorporates a brief description, with working results, of the new vertical retort plant at Exeter, with its auxiliary appliances, for realizing, as is realized, good working economy—expressed, in one form, by 5000 tons of coal per annum. The figures which prove the claims were obtained on coal somewhat inferior in quality to that delivered prior to the war.

In the call to a higher efficiency, the industry must not stop at carbonization. The President passes on to the residual products. He agrees with us [*ante*, p. 241] that the products of coal carbonization other than gas deserve a more dignified descriptive name than "residuals." The scope of gas-works operations has undergone large change; and greater care in the production of commodities secondary to gas, as well as the development of the number of products, have a commercial advantage of an order that grows in importance when a comprehensive review of prospects is made. What Mr. Westlake has to say about coke, tar, sulphate of ammonia, and benzol, we commend to the attention of readers. There is improving work to be done in all of these; and each, owing to circumstances fashioned by the war, now presents to the makers a larger commercial opportunity than the old traditional ways and ideas had allowed

them to contemplate. Coke is being more extensively used for steam-raising to-day; tar is, through the dehydration process, going to obtain considerably greater direct local sale; sulphate of ammonia is being largely sought after for use on our native soil; and as to benzol, we suggest notice of certain statements made in an article by "Cricket" published this week. The allocation of labour in the gas industry, too, will undergo revision through the enlightenment that has accrued from the experiences brought about by the war. It has been shown that there is work in the industry which women can well undertake, and man power can consequently in normal times be liberated not only for the increased work of the industry, but for the national development that is gradually but surely making way. Compulsory experiment and adaptation have indeed brought unexpected proof of a capacity for economy in many directions. The part of the gas industry in our future national life and expansion can be filled by a common (but not a scattered) response to the call for a higher efficiency.

Summer Saving of Artificial Lighting.

The automatic saving of artificial illumination by the putting forward of the hands of the clock by one hour during the six lightest months of the year, has taken a long stride forward towards becoming a permanent institution. What was more or less an experiment last year caused previous fears as to the general results (distinct from artificial lighting) to vanish, and reinforced the claims of those who had been advocates of what is now almost universally admitted to be a politic social reform. The experiment proved that the disadvantages were completely overweighed by the solid character of the advantages. It is the conclusion—it was the expected conclusion—arrived at by the Committee appointed by the Home Secretary to inquire into the working and results of the Summer Time Act last year, and to advise as to the future course of action. The Committee are in favour of the permanent establishment of the scheme, with the variation of time from the normal running from the second Sunday in April to the third Sunday in September of each year. The greater the effect in reducing the lighting business of the purveyors of artificial illuminating agents, the greater the argument in favour of the economic advantage of the change. That might well be a reason for opposition on the part of these purveyors. But they have to bow to public opinion; and it is no use trying to resist the permanent establishment of the scheme when ninety-nine out of every hundred intelligent people whom one meets are favourably impressed by the experiences during the summer months of 1916.

In the present condition of things, welcome will this year be given to the repetition of the change by some managements of gas undertakings who have been harassed almost beyond human endurance by this winter's work, through the accumulated difficulties of materials supplies, shortage of labour, austere atmospheric conditions, and the close working of plant, which in some cases has presented little margin on the maximum day's output through the necessity for keeping in abeyance extensions, and the impossibility of getting materials and labour for the work. New records in maximum day outputs have been established this winter with all the conditions opposed to meeting and effectually handling them. But there has been success. The managements of these undertakings will not be displeased with the respite, such as it is, that the Summer Time Act will give them; and the experiences of the winter from which we are just emerging will induce them to make the utmost use of the summer months in fortifying themselves, as far as possible, with repaired plant and stocks, for anything that may occur next winter. The standards supplied by all previous experiences have been knocked on the head; and new standards have been set up by the demand for gas for heating purposes during the period that the thermometer, at different times and in different quarters of the country, was showing (say) 5° to 20° of frost. The new standards are the ones that will have to be observed in future.

The Home Office Committee have had difficulty in arriving at any reliable basis for estimating savings of gas and electricity directly due to the operation of the Summer Time Act last year. The complexity of the present conditions so defies penetration that nothing very definite in this regard can be realized. Electricity does not offer in residential districts so many complications as gas in arriving at an approximate idea as to effects. But gas, with its diverse uses through the one meter and at one price, has to be subject more to guesswork than reliable calculation in trying to realize what the effects were in the saving of gas for lighting, and consequently of coal. Therefore, all computations given in the Committee's report (from which we have extracted, and publish this week, the parts that will most interest our readers) must be treated as merely the product of a desire to help the Committee so far as inner knowledge goes in regard to the quantities of output at different hours, but which knowledge after all, with the current upheaval of conditions, can only offer a basis of a most fragmentary kind. However, the essays in this direction, combined with general knowledge, enable the Committee to say the net aggregate saving of gas and electricity, and therefore of coal, must have been considerable. But we should not like to assert that there was much truth about a saving of over a quarter of a million tons of coal due to economy of gas for lighting last summer, nor that the gas consumers of the United Kingdom saved by a less consumption of gas for lighting close upon half a million sterling. Still, it is not the savings from gas or electricity, or the promotion of fuel economy, that justify the Summer Time scheme as a permanent institution. It is the public favour won by the first experience.

The South Suburban Calorific Power Decision.

Our readers will have noticed that, almost without exception, applications under the Standard of Calorific Power Act have been for a standard of 500 B.Th.U. gross, regardless of the candle power proposed to be displaced; and also that, so far at any rate as we are aware, no Order has yet emanated from Whitehall for any other standard than 500 B.Th.U. Is it to be assumed from this that uniformity under all conditions is the aim of the administrators of the Act? If so, they may be reminded—though 500 B.Th.U. may be in the Model Clauses—of a report by the Board of Trade, made as recently as 1914, laying stress on the advisability of fixing the standard of calorific power according to the circumstances of the undertaking; also that there is nothing about uniformity in the Act. The Act, we may point out, was passed for the express purpose of affording relief to gas undertakings who are doing their best to assist the Government by extracting benzol and toluol from the gas.

We are led to make these observations by what has occurred [*ante*, p. 451] with regard to the application of the South Suburban Gas Company for the universal extension of the calorific power standard, already in force as regards three-fourths of their output, to the remaining one-fourth. This Company, as is well known, was a pioneer in its acceptance of a calorific power standard; and, by-the-by, was the first to adopt British measurements in connection therewith. It is now refused relief under the Act because, in effect, it declines to recede from the position which was conceded to it by the London County Council in 1912. This is nothing more than the fact, because it must be plain to every one that to have accepted 500 B.Th.U. for a part of their district would have meant the practical acceptance of this standard for the entire area. It is all very well for the London County Council now to say, as they did at the inquiry, that they made a mistake in 1912 in agreeing to 475 B.Th.U., although they had for years previously been testing the gas of the London companies for calorific value. One is led to wonder on what principle of intelligence and equity the business of the Council is conducted, especially in view of the rather one-sided evidence put forward at the inquiry on their behalf.

As to the contention of the local authorities, that their adoption of 475 B.Th.U. would mean a lowering of quality, what is there to differentiate this case from those of (say) Sheffield and Lea Bridge, where a reduction of quality might reasonably be expected from the substitution of 500 B.Th.U. for 15 and 15½ candles respectively? We are not criticizing the decisions in these two cases, but fully approve of them, and more especially as the competitive conditions under which gas supply is conducted to-day give full protection to the gas consumers, quite apart from the operation of the sliding-scale, where it applies. The South Suburban Company's contention was that there would have been practically no reduction; and this is borne out by comparing the calorific value tests taken (subterraneously) by the London County Council with the candle power tests as taken by the Company during the same period at the Beckenham

testing-station—the average of each being 484 B.Th.U. as the equivalent of 13½ candle gas. It is difficult to escape the conclusion that in this case, at any rate, a desire to secure uniformity has overborne the plain intention of the Act.

Railway Companies and the Calorific Standard.

In the City of London Gas Act of 1868, an important principle was laid down, which has since been observed in connection with all statutory enactments relating to gas-testing. It stated that the burner to be used in testing was "to be "such as shall be the most suitable for obtaining from the "gas the greatest amount of light." It follows from this that the burner would have to be used in manner best suited to the realization of the "greatest amount" of light. In the "Journal" for Feb. 27, we published a criticism of some tables [see pp. 391, 398] which had been prepared by the Lighting Department of the London and North-Western Railway, and which had been laid before Mr. Garnham Roper at the Board of Trade inquiry into the application, under the Gas (Standard of Calorific Power) Act, of the South Suburban Gas Company, for the revision of their standards of quality, so that 475 B.Th.U.—the penal point of their existing standard of calorific value—should be the standard over their whole area, instead of, as now, in part only—an illuminating power standard still applying in the other part. Now we learn that the broadcast publication of the tables in question was not intended; if it had been, there would have been explanations attached. Further, it is understood that in one quarter it is considered that the general tenour of the criticism is unfair to the Lighting Department of the North-Western Railway Company.

As to the first point, the fact that the tables were submitted for judicial purposes at a Board of Trade inquiry, and so formed part of the proceedings, and of the case of the opposition to the application of the Company, is sufficient justification for our acceptance of them as they stood (without any explanatory details as to conditions of testing), and basing a criticism upon them. As to the second point, the alleged unfairness appears to consist in having, with the fundamental testing principle in mind, examined the figures from the point of view of the gas industry, and not from that of the London and North-Western Railway Company, as gas consumers who only want, on grounds which will be stated later on in this article, to get from (nominally designated) 30, 50, 60, or 100 candle power burners, a light of 30, 50, 60, or 100 candle power, no matter the calorific value of the gas consumed—whether 440 or 520 B.Th.U., or any intermediate value. The words in our article, apart from the criticism of the figures that is considered unjust to the Lighting Department of the Railway Company, are these: "Now we submit that the figures presented in these tables "have not any great value, and for the reason that the basis "on which they have been ascertained is altogether wrong." We will remove any feeling that this passage casts any reflection on the capacity of those responsible for the tests by extending it in this way: "Now we submit that the figures "presented in these tables have not any great value *from "the point of view of the gas industry*, and for the reason that "the basis on which they have been ascertained is alto-"gether wrong, *having regard to the recognized principle of gas "testing, that the gas itself is entitled to the greatest value that "can be secured from it, under normal pressure.*"

Having said this, let us endeavour to explain, in so far as we understand it, the point of view in the making of the tests of those responsible for them and the resulting figures. The London and North-Western Railway Company, as some of the other railway companies, have to deal with the gas supplied in numerous towns running from one extreme end of England to London, the gas undertakings of which towns naturally, for economic reasons, use the most available coal for the production of their gas. The gas industry cannot help the provisions of Nature; and it has during the war especially been the victim of her capriciousness in respect of variable coal constitution. The consequence is that the chemical composition of gas and the calorific power at any time vary more or less as between different places, according to the coal used and the methods of its carbonization. From this it will be seen that a railway company, in having to deal with different compositions and different calorific values of gas, are in an exceptional position. Their case is not the case of an ordinary consumer who is situated in one town, the composition, calorific power, and pressure of the gas in which are fairly constant, unless, as in the present disturbed time or during strikes, extraneous circumstances intervene to cause unusual variations. Lighting, too, is not the only use of gas. Obviously, it is impossible for Parliament to legislate for such exceptional or abnormal conditions as those in which a railway company, through vast ramification, find themselves as gas consumers; legislation must deal with local circumstances as they exist.

The next point to consider is that, under normal conditions, and not under the prevailing lighting restrictions, the London and North-Western Railway Company throughout their system are standardizing the lighting of the stations. To do this, they adopt uniform patterns of lamps—say, the 30, 50, 60, and 100 candle power types already referred to, and then nipple them to secure with the local gas approximately these candle values. By these means (apart from any differences that may arise through variations in surroundings) they know that, with certain spacings of the lamps, they can, *cæteris paribus*, get certain illuminating results. In this way, they control the gas to suit the lamp, and not necessarily (it may be) in all circumstances use the best lamp to suit the gas. The aim is economy coupled with reasonable efficiency—economy by standardization of lamps and fittings, and admittedly right too in their special circumstances. But this does not prove that, with different compositions and calorific values of gas, economy in the gas itself (which is another object) could not at some stations be derived from other lamps more widely spaced, and yet giving the same minimum foot-candle illumination at the intermediate point between the lamps. We still submit that the special circumstances of a railway company are not the circumstances that should, under the conditions of gas supply, have governing influence in legislating upon such a matter as the calorific standards for gas.

What is here stated will indicate the lines upon which the investigation proceeded in order to ascertain the consumption of gas, *with fixed illuminating powers* according to burner, while using gases varying the one from the other in respect of calorific values; and from the results so derived were calculated the candle powers per cubic foot of gas consumed. The limitations thus imposed upon the gas are not those that would obtain in ordinary everyday practice. In this connection, we are told that we were wrong in assuming that the two light 60 and 100 c.p. lamps simply contained two of the 30-candle or two of the 50-candle power burners. The 60 and 100 c.p. lamps, the information is now given, are constructed in such a way that the two nozzles and mantles are fed from one superheating chamber. Very well. Upon whom rests the fault for misinterpretation? The headings to the tables are: "One light, No. 1 Burner, 30 c.p." "Two light, No. 1 "Burner, 60 c.p." "One light, No. 2 Burner, 50 c.p." "Two light, No. 2 Burner, 100 c.p." No. 1 and No. 2 burners are mentioned in both instances of the two-light lamps. That is distinctly misleading to anyone studying the tables. This brings us back to the point as to whether the data given in the tables prove what they were intended to do; and we ask readers to refresh their memories in this connection as to what was stated in the previous article [p. 391]. What the data prove is that the burner used (it may, we assume, be taken that the pressure was governed in all the tests) has great influence upon the results obtained, seeing that in the one-light 30-c.p. burner 500 to 510 B.Th.U. gas gave 20·4 c.p. per cubic foot consumed, while a 440 to 450 B.Th.U. gas in a two-light 100-c.p. burner gave 20·5 c.p. per cubic foot. In considering such data as are presented in the tables under notice, it is hoped that the Board of Trade fully appreciate the point that calorific power is far from being the only factor in producing the illuminating value realized by the consumer, but that the burner itself and the method of using the gas are important. The Lighting Department of the London and North-Western Railway has proved this. We also reiterate the view that, to ascertain with an incandescent burner the illuminating values of different calorific value gases, it is not doing full justice to the gas to regulate each quality down until the same point of candle-power is photometrically shown, and then to read the consumption at that point, and work out from it the candle-power per cubic foot for each calorific quality. The reason for this view, we think, was made sufficiently clear in our article a fortnight since. Highly valuable as is the custom of the railway companies to the gas industry as a whole, they are, we repeat, differently circumstanced from ordinary gas consumers, who constitute the main customers of gas undertakings.

Intrinsic Brilliancy and Brilliant Fallacies.

The majority of the active members of the Illuminating Engineering Society are sticklers for accurate scientific measurement; and they hold that reliance upon visual effects or judgments is not to be encouraged, when scientific measurement is available, owing to variations that obtain in the optical organs of persons, and consequently in their determinations. Candle power and surfaces are capable of measurement; but, in our "Correspondence" columns to-day, Mr. Arthur Cunnington, referring to the comments we made on Feb. 27 (p. 394) upon certain contentions of his, contemptuously pushes aside the determinations of scientific workers, and asks us to look successively at a 30 c.p. gas mantle and a 30 c.p. metal filament lamp, and then tell him if the latter is thirty times as dazzling as the former. He does not allow us to answer the question, but does so himself, with an assertive "Of course not." To look successively at one form of light and then at another is rather apt to give quite a false impression. And, therefore, until someone dislodges by scientific proof of inaccuracy the work that has already been done, we shall prefer to accept the authority of that work rather than that of Mr. Cunnington's eyes. At the same time, we do not understand that Mr. Cunnington disputes that the intrinsic brilliancy of the metallic filament lamp is greater than that of the low-pressure gas mantle. He also puts a wrong interpretation upon our statement that the large spaces between the filaments of an electric lamp give them "stronger definition." He says the meaning of this is that the eye, being less dazzled, can see more clearly. That is a pure twisting of the meaning. Let us take an extreme illustration, so as to let Mr. Cunnington grasp the intention, as he has evidently failed to do from our previous manner of expression. Through Dr. Kerr's paper and in the discussion, it was admitted that, if a lamp has a dark environment, its incandescent filaments stand out with stronger definition, and project themselves more injuriously upon the eye than when placed among light surroundings or when there is general lighting to tone-down their stark staring outlines. Thus half-a-dozen smooth hair-like filaments with large spaces between them must stand out with stronger definition, and have more effect upon the eye, than the hirsute filaments of a closely woven incandescent mantle. There are not many mantles made nowadays with a mesh so coarse that when in use the eye looking at one side of the mantle can penetrate through the opposite side, and Mr. Cunnington's experience must confirm this. However, he says that personally he thinks that modern high power illuminants—whether gas, electric, oil, or acetylene—are from the ophthalmic standpoint all tarred with the same brush. Probably they are; but there are degrees even in the physical and chemical characteristics of tar.

Patriotism and Private Gas Enterprise.

It is easy enough to say: "I have not thought it worth while to reply to the article;" it is sometimes very difficult to make a reply that will stand critical examination. Alderman Merrells, of Swansea, does not think it worth while to reply to the protest we made in our issue for Feb. 27 (p. 392) against his assertion—in connection with the provision for high explosives and the conjoined question of a calorific standard—that there had been "an utter want of patriotism on the part of the privately owned gas concerns of the kingdom," and that they had "practically held a pistol at the head of the Government." These are sweeping statements; and there is an unkind and unjustifiable sting about them. Either privately owned gas undertakings have shown an utter want of patriotism, or they have not. Which is it, Alderman Merrells? Was your statement true or untrue? If untrue, then act the part of a gentleman and apologize; if true, show it to be so. We are quite prepared from actual knowledge to deal with any attempted justification. Random statements do not become an Alderman any more than a Cabinet Minister. But now Alderman Merrells says it was distinctly stated at the Board of Trade that, if there had been no "pressure" brought to bear, the period of three years would have been fixed—that is to say, the period beyond which application may be made for revision. This seems to indicate that Alderman Merrells' inflated remarks were due to something said at the Board of Trade, which, as now rendered by the Alderman, sounds pleasantly modest compared with the phrase as to "holding a pistol at the head of the Government." Alderman Merrells does not know anything about the cost of the plant necessary for oil-washing gas, and distilling the oil for the recovery of what is required by the Government. Nor, we undertake to say, does he know much, if anything, about the commandeering by the Government of the product of the oil-washing at a price that, were it not for their patriotism, the gas undertakings could well do without, if it released them from the work. What is being done means expensive plant, a lot of work, and constant supervision, practically without compensation. It means a complete upheaval of the old conditions; and it was not a "pistol," but a sense of justice that enabled the Board of Trade to see that a five years' tenure of the new conditions without any chance of disturbance would, with the war and its effects unknown quantities, be fairer than three years.

And Still Another Error.

Again Alderman Merrells is unfortunate in his statements. He has made a further mess of facts by interfering in a matter about which he manifestly knows so little. He is reported by the "South Wales Daily Post" to have said:

> The Local Government Board, who made the Orders for municipal gas undertakings, gave only three years, and that in itself proved that the Department, or the heads of the Department, thought that period was ample; and as the privately-owned companies would not accept less than five years, that went to prove there had been a want of loyalty on the part of those companies when they made demands over and above what was considered necessary for the public undertakings.

Now what is really considered necessary for the "public" undertakings? So far, two Local Government Board Calorific Power Orders have been printed and published. One is the Leeds Corporation Order. Article VII sub-section (*b*) begins: "If after the expiration of five years from the date of this Order . . ." Where is there anything about "three years" there? The other Order is that referring to the Wath and Bolton Gas Board. Sub-section (*b*) of Article VII of the Order begins: "If after the expiration of a period of five years from the date of this Order . . ." Where is there anything about three years there? It is quite evident that Alderman Merrells is in a very uncertain position regarding the statements that in this particular matter he thinks fit to offer to the eyes and ears of his Swansea public. Do the Leeds and the Wath and Bolton Orders support the ground for his reiteration of the charge of want of loyalty on the part of private gas enterprise?

Gas Profits at Manchester.

In connection with the appointment of a Trading Profits Special Committee of the Manchester Corporation, as already recorded in the "Journal," renewed attention is being given in the city to the question of the appropriation of gas profits. At the beginning of April, 1914, the Council decided upon fixed annual contributions to the rates by the four trading committees for the succeeding three years. This arrangement will, of course, with the close of the present month, come to an end by effluxion of time; and so the Special Committee were appointed to consider the whole subject, and decide upon the policy to be adopted in future. There is no need now to emphasize the difficulties which beset attempts at a final solution of the municipal trading profits problem. Circumstances, personal interests, and what not, incline some people to take one view and some another; and there may be even town councillors who have a tendency to regard the matter from their own particular standpoint. Broadly speaking, however, it would no doubt be correct to say that the feeling is gaining ground that there is an injustice in compelling trading committees to contribute to the relief of the rates the large sums that they have very often in the past been called upon to do. As to whether the prevailing complicated position will accelerate or retard the growth of this view among councillors, it would be rash to hazard an opinion; for while profits may be harder to earn, there are municipalities who stand now in greater need of them than ever. In the Manchester Gas Committee, the case of the consumers has in the past been warmly championed by well-known members; but the advocates of big contributions in aid of the rates have up to now prevailed. At this stage, however, Councillor M'Lachlan contends, in an article by him in a local paper, that the problem facing the Gas Committee is a matter of surpassing gravity; and the decision which the Council may make in dealing with it means much to the future of the Manchester gas undertaking, inasmuch as the commercial success

of Greater Manchester will depend upon the ability to offer cheap services to all persons who propose to develop industries in the district. This is an aspect of the matter which the Council can hardly afford to ignore.

The Proper Basis.

The decision arrived at three years ago by the Manchester City Council was that each trading committee should be called upon to provide an annual contribution to the city fund which should amount to a stated percentage on the capital invested in its undertaking. For the Gas Committee, the figure was £50,000, which worked out at about 1¾ p.ct. on the amount actually invested in (or expended on) the undertaking. But for years past the gas consumers have been rapidly and unceasingly paying off the capital expended; and the undertaking has not actually cost the ratepayers, as such, a single penny. On the contrary, since the gas-works were transferred to the Corporation in 1843, a total of £3,267,174 has been contributed in aid of the rates—or getting on for £200,000 more than the sum shown as having been invested in the concern. These facts, and others equally convincing of the undesirability and unfairness of the present policy, are set forth by Mr. F. A. Price (the Superintendent of the Gas Department), in some notes prepared by him for the information of the members of the Gas Committee. The contention is advanced by Mr. Price that, as the outstanding mortgage debt on the works is secured on the rates, the amount of such debt is the true and proper factor upon which to base contributions (if any) to the rates; and, in support of this, he quotes the well-known Parliamentary Committee decision that, in the particular case before them, a maximum of 1 p.ct. on the outstanding debt should be paid over in aid of the rates. Now, the outstanding mortgage debt on the Manchester gas undertaking at March 31, 1916, was £973,372; and on this £50,000 represents, not the 1¾ p.ct. mentioned above, but nearer 6 p.ct. In other words, 1 p.ct. on the outstanding mortgage debt would be well under £10,000. Much could be done with the £40,000 odd that would thus be saved to the undertaking (calculated on the basis of recent contributions). It would greatly assist in the carrying out of the principle which, as Mr. Price says, should underlie the municipalization of any industry—the provision of a cheap and efficient service. Such a service must be of benefit to all the ratepayers, whether or not they happen to be actual consumers; and in connection with gas, of course, a cheap supply is particularly desirable on many grounds—some bearing closely on the well-being of the citizens.

Employment under the Munitions of War Acts.

In the "JOURNAL" for March 7 last year, there appeared a notice of a little book on "Employers and Workmen under the Munitions of War Acts, 1915 and 1916," by Sheriff Fyfe, of Glasgow. The later Act, which materially altered the original one, had then only recently been passed; and though, as was pointed out at the time, the author's position as Chairman of a Munitions Tribunal—he is also one of H.M. Judges at Glasgow—had afforded him special facility for becoming familiar with the Acts and the questions most likely to arise under them, there had necessarily not been the opportunity for actual experience of the operation of the different provisions which has since occurred. For one thing, the Appeal Tribunals, which were first constituted by the 1916 Act, had not yet become operative; and in the year which has since elapsed, many interesting and important judgments have been pronounced by the Appeal Judges. These considerations certainly called for a new edition of the book, if it was to be of the greatest use possible to harassed employers. This demand has been excellently met by Sheriff Fyfe—a second edition having now been published [price 10s. 6d. net] by Messrs. William Hodge & Co., of London and Edinburgh. In this, the decisions of the Appeal Judges already referred to are summarized and commented upon; while the book generally may be said to fully justify the claim of being a handbook explanatory of the duties and responsibilities of employers and workmen under the bulky emergency legislation with which it deals. There has been no intention on the part of the author to write a legal treatise, but merely to explain in popular language the scope and effect of the Acts. The text of the two Acts is consecutively arranged, with the 1915 enactments in black type, and the 1916 amendments in red; and this is followed by the rules of the Minister of Munitions with respect to the limitation of profits of a controlled establishment. Then, among other matters there are set out the rules and regulations governing leaving certificates, munitions and appeal tribunals, ordering of work, dilution of labour, and war service badges—all this is information of paramount importance at the present time, and such as should necessitate at least a repetition of the three impressions to which the first edition of the book ran.

PERSONAL.

The management of the Malmesbury Gas Company has been taken over by Mr. D. COOKSON, who was previously Manager of the Hungerford Gas-Works.

Mr. J. M. SUGDEN, Manager of the Whitchurch (Hants.) Gas-Works, has been appointed to a similar position with the Wadhurst and District Gas Company, where he succeeds Mr. J. B. HYDE, who is taking charge of the Hawkhurst Gas-Works.

The "Co-Partners' Magazine" of the Gas Light and Coke Company reports, in the current month's number, that Mr. GEORGE ORFORD has resigned the position of Assistant Accountant after having held the post for twenty-two years, during which period he acted in this capacity under three Accountants. At his request, and with the consent of the Directors, Mr. Orford (although renouncing his title) will remain with the Company, thus extending his already long service of forty-eight years.

It will be seen from our report of the proceedings at the meeting of the Southern District Association of Gas Engineers and Managers, that Mr. W. E. Price announced that Mr. F. L. HALFORD, of the Explosives Supplies Department of the Ministry of Munitions, was suffering from a somewhat severe illness, and that Mr. W. DOIG GIBB, who has been associated with him for some time now, has taken up the additional work during the time of Mr. Halford's enforced absence. Our readers will, with ourselves, sincerely regret even the temporary loss of the services of such an ardent worker in the country's cause as Mr. Halford, and will join with us in wishing him a speedy recovery.

OBITUARY.

The death has occurred, very suddenly, of Mr. JAMES A. LAUGHLIN, of Belfast, who just a few weeks ago had been appointed Chairman of the Corporation Gas Committee—having previously held the vice-chairmanship for a considerable period. Mr. Laughlin took the utmost interest in the gas undertaking; and his work was greatly appreciated by all sections of the citizens. He had reached his 74th year.

Reducing the Water Content of Tar.

According to Mr. William H. Earle, in "Gas and Electric News," changes in the tar and liquor separating and handling arrangements at the works of the Rochester Railway and Light Company have resulted in reducing the water content of the tar shipments from 25 to 30 p.ct. to an average of 8 p.ct.; the minimum being 5½, and the maximum 11. For more than a year, excessive water in the tar has been a source of much trouble; and while it was in some part due to the nature of the coal used, and the carbonizing system, there was evidence of room for improvement in the methods of handling the tar. An examination of the percentage of water in the tar at various parts of the plant indicated that the method of drawing off the contents of the displacement tank was at fault. The outlet entered the tar well at a level some distance above the surface of the contents and, under a head of 30 ft., discharged with sufficient force to energetically mix up, and churn back, liquor already separated from the tar. The same thing happened with the overflow from the dehydrating tank, which entered the separator in the tar section near the outlet, and, passing with the contents of that vessel to an opening in the top of the tar-tank, fell down into, and agitated, the contents. The remedy is to continue the outlet from the displacement tank to near the bottom of the tar well, below the pump suction pipe, and to arrange for the overflow from the dehydrating tank to discharge into the receiving section of the separator, and for the outlet from this also to extend below the surface of the liquid in the tar well; thus avoiding agitation and churning of the contents. A new heating coil is also installed in the dehydrating tank, consisting of a continuous spiral of ¾ in. wrought-iron pipe, 8 in. diameter and 15 ft. long, also a small spiral in the storage well near the suction pipe, to facilitate handling the tar at this point.

The "Journal" Postal District Number.

With the view to improving the postal service and to simplify matters for sorters and postmen, the districts of London have been numbered; and "JOURNAL" correspondents are requested to place the allotted number after the district initials. Our number is "**4**." The placing of the number thus—

"GAS JOURNAL,"
11, Bolt Court, Fleet Street,
London, E.C. **4**,

will ensure as prompt delivery as the postal system will allow. If correspondents will observe this, we shall be indebted to them; and they will not be disappointed by unnecessary delay.

THE GAS INDUSTRY AND WAR FINANCE.

Reports of company meetings that have come to hand during the past week afford information as to a few subscriptions by gas companies to the great War Loan; and these we are glad to be able to add to the lists that have already been published in our columns.

Besides their direct subscription, it should be stated that the Sunderland Gas Company have offered facilities to their employees, to enable them to invest. In the same direction, the Salford Gas Committee have authorized the purchase of 2000 War Savings Certificates, for which the employees will, through the War Savings Association, pay by instalments. Mr. A. Batten (the Hon. Secretary), sending some particulars of the War Savings Association at the Mitcham works of the Wandsworth, Wimbledon, and Epsom District Gas Company, says he can endorse Mr. S. E. Halliwell's statement that it is necessary by personal appeal, not only to obtain new members, but to see that existing members pay their subscriptions regularly. A meeting of employees at the works was convened last July by the Resident Engineer (Mr. W. T. Hogg), when officials were elected; and the Association was duly enrolled under Scheme 2A. In the week ending Aug. 5, 39 members were secured; while on the 3rd inst., 86 were on the membership roll. During the 31 weeks' existence of the Association, 327 certificates were purchased; and of these 300 have been allocated, leaving 27 in the hands of the Treasurer.

The following amounts are quoted without distinguishing between new money and conversions.

Blyth Gas Company	£2,500
Kendal Corporation	1,000
Shotley Bridge and Consett District Gas Company	4,000
Southampton Gas Company	10,000
Stretford Gas Company	15,000
Sunderland Gas Company	39,520
Tynemouth Gas Company	5,000

ELECTRICITY SUPPLY MEMORANDA.

The electricity undertakings that are having what cream there may be about war time experiences are those situated in industrial areas into and out of which munitions work is running with full flow, and which are near coal supplies. The managements of others are not looking with any great enthusiasm upon the present or the prospective situation. There are, the week by week reports show, considerable deficiencies in not a few cases. Some came out of the last financial year's struggle with a deplorable showing on the wrong side—due probably to special circumstances, or to extraordinarily bad luck in the securing of coal supplies, or to a reticence in looking possibilities squarely in the face, and raising the charges to consumers accordingly. In certain cases, too, power contracts have contributed to losses through the insufficiency of margin above normal bare generating costs. The ratepayers of several districts will learn that income-tax and the prices of the necessaries of life are not the only things that have gone up. The local rates will in not a few cases exhibit a higher level; and the non-electricity using ratepayers will, in these hard times, have the felicity or otherwise of compulsorily assisting to pay for the supply of electrical energy to their fellow ratepayers. The morality of the impost is not altogether clear; but it is a line of conduct in local government that has been much broadened and lengthened since municipal electricity supply came into the field. Example comes from Kingston-on-Thames. The deficit on the electric light undertaking has resulted in an increase of 2d. in the pound on the rates. The Gas Company, who have had to face all the similar war conditions as the electricity concern, will have to pay their part of this increase; but if they wanted it never so badly, they would not obtain any succour from the rates, the same as the competing concern, which has obviously been carrying on the competition with non-paying prices. Take Worksop as another example. If the report be true, there is a most artful move there, intended either to mask something or other, or to put a better complexion on the electricity undertaking than it deserves. It is stated that the Council have added 2d. to the rates this year, in order to meet the income-tax on the profits of the electric supply and water undertakings. If there is a deficit, and if income-tax swells the amount, then why not say so? It is stated that the income-tax practically amounts to a 5d. rate. Income-tax applies to the profits on which the tax is levied; and we have never heard before of such a strange case as compelling other people to pay the tax. Fancy the gas consumers being asked to help to pay the income-tax upon the profits of the electricity undertaking, when they have to meet their own share of the tax, and have supplied the profits to the gas undertaking from which its part of the income-tax has to be paid. It is about the coolest piece of municipal impudence of which we have ever heard. We sincerely hope for the sake of the Worksop councillors that the report is inaccurate. Or if it is a question of deficit, then let it be so called, by all means.

Ratepayers and Electricity Deficits.

But many of the undertakings that would have disaster before them if they went on another year without further raising their charges, are inaugurating this year by giving the necessary notices of such a proceeding, which is prudent. There are gas undertakings that are doing exactly the same thing. There is practically no competition for the time being between electricity and gas undertakings; the "munitions" of competition are too scarce for any great activity in that way. This being so, there need be no fright over making necessary and reasonable increases, instead of running along with short charges, and then finding it necessary to draw upon the ratepayers generally to meet a more or less considerable deficit. But in making advances in prices, the administrators of electricity undertakings should not indulge in decimals or vulgar fractions. It must be a dreadful thing after a hard day's work for an electricity consumer to have to check an account for so many units for lighting and so many for heating at prices in which fractions of a penny are used which have no equivalent in the coinage. This all comes we suppose from the love by electricians for (as Prof. Armstrong would put it) the "higher mathematics." We see that Accrington has now raised its flat-rate for lighting from 4·8d. to 5d. That is better than 4·99d. or 5·1d. But the charge for heating they have raised from 1·2d. to 1·3d. Consumers who have their supply on the rateable value system are to have their charges increased—that is, the charge per unit beyond the lump sum—from 0·6d. to 0·7d. To increase the arithmetical exercise, a discount of 2½ p.ct. is allowed. For power purposes, there is to be an all-round increase of 10 p.ct. Batley is going the other way to work. They do not deal in prices containing decimal numbers, but in solid sums. It is there proposed that from April 1, exclusive of meter-rents, the minimum charge for lighting is to be 25s. per annum; for power, £2 13s. 4d.; and for lighting and power, £2 13s. 4d. Every week brings its new list of price advances—now additional upon preceding ones. Among others we see that Leicester has to raise its power charges by 15 p.ct., and its lighting charges from 4d. to 4½d. and 5d. to 5½d. Not only to an improvement of financial conditions though the charges to consumers are electrical engineers looking, but many of them think that they could improve the position of their concerns by largely increasing the capital expenditure upon extensions. The Local Government Board have one formal reply to these: "Unless you can prove the expenditure is wanted for supply that will be beneficial to the war, we are not going to sanction loans." And a good thing too, with capital conditions where they are, with the prices of materials what they are, with the scarcity of labour what it is, and with the engineering workshops busily engaged on the country's work, and little time, materials, or labour for anything else.

More Revenue Necessary.

All breakdowns of electricity supply that are due to the large influx of demand occasioned by the war cannot be charged to any want of prevision on the part of the electrical engineers or the committees concerned. At the same time, it must be very tantalizing to consumers and the public generally when they find that the deficiency of supply, breakdowns, and industrial and tramway inconveniences could have been avoided if an authorized programme of new works had been carried out promptly, instead of wordy discussions and dilatoriness on the part of committeemen being allowed to intervene to cause the delay which ran straight to disaster. That is what has happened at Birmingham. There have been several breakdowns there; so many that the public have got inured to them. But the inconvenience was considerable, and the money loss to the Tramways Department is computed at many thousands of pounds. A Committee, consisting of Messrs. Appleby and Beale, have made a close investigation into the matter, and have presented their report to the City Council. They find that the failures were primarily due to the abnormal demand for electric current following the outbreak of the war, and which demand was greater than the Electricity Supply Committee could reasonably have been expected to foresee. There were certain mechanical breakdowns; some of the cessations were traceable to insufficient steam, owing to the inferior quality—a large ash content—of the coal supplied; and the coal-handling facilities at Summer Lane also suffered collapse. Troubles rarely come singly. The Electrical Engineer had a lapse from his usual state of health. So far everything can be excused. But it was in 1911 that the Electricity Supply Committee obtained the sanction of the Council to a new station on what is known as the Nechells site; and it is over the construction of this station that the Committee have expended many words and laid waste much valuable time. They have adopted the Engineer's original scheme, and have rejected alternative projects which interrupted progress. The Investigating Committee blame the Committee for the dissipation of time; and, while the war is directly responsible for the difficulties that have been experienced, it is the failure to carry out the 1911 programme that found the Committee unprepared for the great emergency. It is a sad pity; but the harm has been done. The lesson has been a costly one; and Birmingham must rest satisfied that as soon as progress can be made it will be. But then we may be back to normal times and reduced demand.

The Breakdowns at Birmingham.

Electric-Iron Fire-Raisers.

The simple, the inexpensive, the safe, the convenient electric iron (we think we have the correct advertised descriptions) has proved by its performances the falsity of the adjectival claims; and there are electricians who to-day are looking on it as likely to do the electrical business more harm than good. Hazelbeech Hall—some seven miles distant from Market Harborough—was a large handsome stone building. Hazelbeech Hall was on the night of Saturday, Feb. 24, a charred ruin. It is said the fire originated in the sewing-room, where during the afternoon of the day mentioned one of the staff was ironing with an electric-iron, and the iron was "left on." By the time the fire was discovered—this was about nine o'clock in the evening—it had got good hold of the building; and "a sad scene of ruin" is a local paper's description of the final result. Only two days before the "Electrical Times" published an article, to which the ruins of Hazelbeech Hall would supply a fitting illustration. The article is headed "Fire Risk of Electric-Irons;" and it admits that the risk has long been recognized, and that no simple or effective remedy has yet been found. Reference is made to a bulletin recently sent out by the National Fire Protection Association of America, in which allusion is made to fires caused in New York City by the use of electric-irons. If these individually caused comparatively small damage and money loss, the owners of the property were lucky—more so than is the owner of Hazelbeech Hall. The bulletin discusses the means for reducing the fire risk; but none of them seems effective. Stands for the irons are discussed. Those of good design are said to be safe enough; but "many are unsuitable, others break easily, or are inconvenient to use, while in no case is there any guarantee that users will always replace an iron on the stand," and so keep it from contact with combustible material when not in use. A pilot lamp is another safeguard; but there is nothing to prevent the user ignoring the signal, and leaving the iron on circuit. Thermostatic control, and thus complication, is suggested, and with such control tests show that the risk of fire is "very small." On the whole, it is easy to agree that no effective remedy for rendering electric-irons safe has yet been found. We are sorry about Hazelbeech Hall, though, if our electrical friends will incorporate the information as to its destruction and the cause in their advertising literature, it will act as a warning to those who are inclined to introduce such an element of danger as an electric-iron into their households.

Tipperary Guardians Disillusioned.

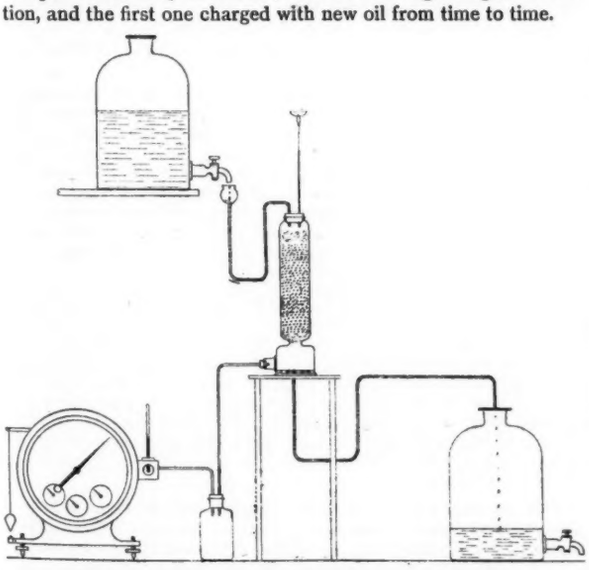
At one time it became fashionable for Boards of Guardians to desire to light workhouses electrically. They were to save money, and the workhouses be converted into little places of paradise. The health of the inmates was to improve; and the ratepayers were to have through their pockets cause for thankfulness to the enterprise of the guardians. There has been disillusionment in more than one quarter. There have been instances in which even the Local Government Board, although used to dealings in big sums, have stood aghast at the lavishness of the electrical installation expenditure; there have been other instances in which there has been bitter disappointment with the result. "It's a long way to Tipperary;" and the Tipperary Guardians have found the way long to the saving of £300 a year which it was predicted would be realized when they adopted the electric light for the workhouse and electrical energy for running their laundry. They appear to have been deceived from the beginning, which incidentally shows their incapacity for deciding upon such a scheme as that which they adopted. Perhaps there is another side to the tale. If there is, we cannot see it, nor where it could possibly come in, in view of a report which has just been made regarding the plant by Mr. J. P. Tierney, Electrical Engineer, of Dublin. From the first, there have been troubles through failures, and through the inability to discover the savings that were to accrue from electrical operation. It is said that some £3000 of the ratepayers' money has gone in this business. That is not a light expenditure for a workhouse. Now Mr. Tierney says the plant is altogether inadequate to requirements; and this has caused it to run down with fearful rapidity. This is not a solitary example of under-estimating to make out a case at the start. We need not go into the details as to the shortage of the plant, beyond saying that the Engineer estimates that it ought to have been equal to 29 H.P. for the present work; while a generating set with a rated capacity of only 12 H.P. was installed. Although the plant is but five years old, the storage battery is now a mere heap of scrap. Something like £350 must be spent on the over-run plant so as to make it equal to present needs, and that is not all that is in prospect. The military authorities are in possession of part of the institution. When they give up their tenancy it will, Mr. Tierney says, be necessary for the Guardians to consider the installation of a new gas-producer, engine, and dynamo, with a capacity of 25 to 30 H.P.

ESTIMATION OF BENZOL AND TOLUOL IN COAL GAS.

A SIMPLIFIED APPARATUS.

By HAROLD E. COPP, Engineer and Manager of the British Gas Light Company's Etruria Works.

IN the ordinary test for the estimation of benzol in coal gas, the gases pass through a series of four bottles, containing green oil to a depth of about 1½ in. to 2 in.; the bottles being changed in rotation, and the first one charged with new oil from time to time.



Apparatus for the Determination of Benzol in Coal Gas.

There are at least two disadvantages about this method: (1) It is questionable whether the whole of the gas comes into direct contact with the oil. If not, some proportion of the benzenes escape absorption. (2) That the accumulated pressure of the meter and the absorption bottles amounts in the aggregate to a greater pressure than is often available for naturally forcing the gas through the apparatus, in which case it is necessary to use an aspirator—a water filter pump being generally employed for the purpose.

The apparatus illustrated consists of an ordinary calcium chloride tower or condensing cylinder, such as that used in the Gas Referees' sulphur test, filled with glass beads; a plug of glass wool being placed both at the top and bottom. The oil is gravitated from an ordinary 3-litre aspirator in a downward direction through the beads. The gas, after being metered, passes upwards through the same.

By this method the test for benzol can be completed much more rapidly than with the ordinary method. The average of several tests by both types of apparatus, taken simultaneously, shows that by the method described an increased absorption of benzol is obtained.

The following results show the average absorption results from 20 c.ft. of gas:

ORIGINAL METHOD.

Drop.	68° C.		
To 100° C. . . .	14·5 c.c.	=	1·755 gallons per ton
100° C. to 120° C. .	2·5 ,,	=	0·302 ,, ,,
120° C. to 145° C. .	2·5 ,,	=	0·302 ,, ,,
145° C. to 165° C. .	3·0 ,,	=	0·363 ,, ,,
	22·5 c.c.	=	2·722 gallons per ton

METHOD DESCRIBED ABOVE.

Drop.	67° C.		
To 100° C. . . .	16·3 c.c.	=	1·972 gallons per ton
100° C. to 120° C. .	2·6 ,,	=	0·315 ,, ,,
120° C. to 145° C. .	2·6 ,,	=	0·315 ,, ,,
145° C. to 165° C. .	3·0 ,,	=	0·363 ,, ,,
	24·5 c.c.	=	2·965 gallons per ton

Sulphate Exports and Values.—In some comparisons which appear in the February issue of the "Journal of the Board of Agriculture," it is shown that in 1916 the exports of sulphate of ammonia manufactured in the United Kingdom amounted to 259,312 tons, value £4,353,860. In 1913 (the last complete year before the war), while the value was practically the same, the quantity exported was very much larger; the exact amount being 323,054 tons, and the value £4,390,547.

MONAZITE IN CEYLON.

The Mineralogical Department of Ceylon have, according to a report lately forwarded to his Government by the United States Vice-Consul at Colombo, announced the discovery of some substantial deposits of monazite. It is stated in a notice of the matter appearing in the "Board of Trade Journal," that a start has been made with working the deposits in two districts of the Southern Province and in Kudaramallie in the North-Western Province, and that the necessary plant for magnetic separation has been ordered.

This encouraging announcement will lend additional interest to a report on "Recent Work on Monazite and Other Thorium Minerals in Ceylon," which was published some little time ago in the quarterly "Bulletin" of the Imperial Institute. It is explained in the report—which deals in an exhaustive manner with the investigations—that a Mineral Survey of Ceylon was instituted in 1902, at the suggestion of the Director of the Imperial Institute, in order to examine the existing deposits of minerals of economic importance, and to search for new deposits of similar minerals, so that trustworthy information should be available as to the extent and value of the mineral deposits of the island, and the way paved for commercial development. The arrangement made was that the explorers should collect mineral specimens of probable value for dispatch to the Scientific and Technical Research Department of the Imperial Institute; and a large number of specimens have been examined at the Institute. Reports on the results of the mineral survey for the years 1903 to 1910 were duly presented to Parliament; but, owing to circumstances arising out of the war, it has been found impossible for the present to continue the publication of them in this form. As, however, the results obtained during the years 1911 to 1915 are of considerable interest, the summary in the "Bulletin" was prepared.

The chief work carried out during the period named was the continuation of the search for thorium-containing minerals; and several promising deposits of monazite were located. First of all, a description is given of shore deposits from Colombo northwards; it being stated that a red earth deposit associated with the gravels covers a considerable area, and this red earth, which is generally about 15 ft. thick, contains monazite, though the percentage of the mineral is quite low. Nambus [a nambu, it is explained, is a natural concentrate of heavy minerals] were found to be more or less local in their development. Some contain 2 or 3 p.ct., or even less, of monazite, and some more; the greatest amount—12 p.ct.—being obtained near Welaboda. Near to Kudremalai a well-developed, rather highly-concentrated nambu was found, about 200 cubic yards of which will yield 22 p.ct. of monazite. In many places on the surface of the deposit streaks and films of monazite are to be seen; but it is pointed out that the presence of such films does not of necessity indicate a rich nambu beneath. The nambu deposits north of Pukulam, though well developed in places, contain but a low percentage of monazite. The nambus along the coast between Colombo and Hambantota may be roughly divided into two groups—the black, which nearly always contain monazite (sometimes in large proportions), and the red, which seldom contain it, and when present the amount is small. The highest quantity of monazite—47·5 p.ct.—was obtained from a surface deposit south of Bentota. Other high percentages were secured in this district; and 10·5 p.ct. was shown by a nambu north of Dikwela, though this deposit was too small to be of any value. Along a straight stretch of beach to the north of Galle a very large deposit occurs; but in this the monazite percentage is very low. It seems that in certain places nambus are being formed along the coast at the present time; while others are being buried beneath deposits of white sand.

The deposit of nambu at Kaikawala beach, Bentota, already referred to, was examined in detail. The percentage of monazite varies from 5 to 20; and the maximum amount per square foot of beach is 30 lbs. A sample of concentrate showed: Thoria, 4·15 p.ct.; ceria and allied oxides, 29·91 p.ct.; uranium oxide, 0·18 p.ct. These figures, the report states, indicate the presence of about 48 p.ct. of monazite in the concentrate; and this agrees with the results obtained by magnetic separation. There would, it is added, be no difficulty in preparing a high-grade monazite concentrate from this material. In order to compete successfully with the Travancore monazite sand, concentrates should contain from 9 to 10 p.ct. of thoria. A concentrate from Kaikawala which was examined consisted chiefly of monazite; and it was found to contain 8·39 p.ct. of thoria, and 58·71 p.ct. of ceria and allied oxides—these being together equivalent to 95·8 p.ct. of monazite. It is remarked that monazite of this quality would find a ready market as a source of thoria.

The presence of monazite, often in small quantities, is referred to in other sections of the report; and then some attention is given to thorianite and thorite deposits. During the last four years, it seems, the systematic prospecting of the principal mineral districts of the island has proved that no large deposits of thorianite exist; and though new placers will no doubt be discovered from time to time, these are not likely to yield any large supply of the mineral. As a matter of fact, there has been a find at Mitipola, a sample of which gave on analysis 54 p.ct. of thoria and 39·3 p.ct. of uranium oxide; and various other locations of limited quantities are detailed.

While referring to this report, mention may be made of the fact that the Mineral Resources Committee of the Imperial Institute (which includes Lord Rhondda, Sir Richard Redmayne, and Sir Robert Hadfield) have recommended that the present staff and operations of the Institute in connection with the supply of information respecting mineral resources should be extended so as to constitute a comprehensive Bureau of Mineral Intelligence, with special reference to the sources of supply and nature of the mineral deposits of all countries within the Empire. The report now noticed affords proof of the substantial character of the work in this direction that is already being performed by the Institute.

REDUCING THE PROPORTION OF UNPROFITABLE CONSUMERS.

In the American gas periodicals, Mr. Leon H. Ware, the Superintendent of the Martinsburg Gas Company (W. Va.), has described a gas-rate schedule based on the quantity consumed, that came into operation on July 1, 1916, and is similar to that known as the "Wright" system in connection with the supply of electricity. It includes a minimum charge of 60 c. per month per meter. Starting with a consumption of 1000 c.ft. per month or less, the price is $1·50; up to a second 1000 is supplied at $1·45, and to the third at $1·35; for the fourth and fifth 1000, the charge is $1·30; the sixth to the tenth is sold at $1·25; the eleventh to the 20th at $1·20; the 21st to the 40th at $1·15; the 41st to the 70th at $1·10; the 71st to the 120th at $1·05; and the 121st to the 221st at $0·95 per 1000, with a cash discount (after the first 1000 c.ft.) of 10 c. per 1000 c.ft., if the account is paid on or before the 10th of the following month. It replaces an even rate of $1·50, and a cash discount of 10 p.ct. on amounts of $5 upwards, with the exception of special terms to industrial users, who were supplied at $1·25 net on a consumption of not less than 25,000 c.ft. per month, and hotels using 50,000 c.ft. and upwards per month were charged $1 net. There was no minimum charge under the old rate.

The minimum charge is based on the actual cost of office expenses, complaints, repairs and maintenance of services and meters, taxes, and interest on outlay; and the principal object is to offer more inducement to the profitable lines of business, without at the same time reducing the average receipts per 1000 c.ft. of gas sold. That they have succeeded in securing this result is shown by the fact that the average receipts during the second half of 1915 were $1·425; those for the corresponding period of 1916 were $1·421. The Company feel assured that the satisfactory results secured by the new schedule will in the near future admit of an all-round reduction in the price of gas, and that the system is the best suited to the requirements of small districts. This experience deserves the careful consideration of all gas undertakings labouring under the disadvantage of a large proportion of unprofitable consumers, who do not use sufficient gas to cover the expenses that come under the heading of "Costs per consumer."

Calorific Standard Applications.—Applications have been received by the Local Government Board for Calorific Standard Orders from the Bury (Lancs.) Town Council and the Bolton Town Council. In the case of Bury, the proposed standard is 500 B.Th.U. No figure is included in the Bolton application; but the Board have suggested 500 B.Th.U.

India and the Coal-Tar Dye Industry.—During an Industrial Conference at Lucknow, Mr. Govila read a paper in which he urged that attention should be given in India to the manufacture of dye-stuffs. He pointed out that India possesses vast coal deposits which can ensure a permanent and unlimited supply of tar benzol. The gas-works are capable of giving a fairly good quantity of tar; while the coke-ovens are steadily growing sources of supply. Roughly, a ton of coal yields 1 lb. of dye; and India's total demand for dyes can be supplied by 20 million tons of coal raised from its mines.

Restricted Occupations Order.—The Minister of Munitions, at the request of the Director-General of National Service, has issued an order, under the Defence of the Realm Regulations, that, in connection with certain industries and occupations, the carrying on of work in factories, workshops, or other premises, and the engagement or employment of workmen, or all or any classes of workmen therein, shall be regulated and restricted in a manner fully set out in the Order. One of the industries to which these regulations and restrictions apply is the manufacture of gas and electric light fittings.

Calcium Cyanamide and Other Fertilizers made in Canada.—Calcium cyanamide is produced on the Canadian side of the Niagara Falls by causing a current of atmospheric nitrogen to pass over powdered calcium carbide made red-hot in an electric furnace. The Canadian production of calcium cyanamide is at present about 48,000,000 lbs. annually; and it is rapidly increasing to meet a growing demand. Nearly the whole of it is exported. Its chief use is as a nitrogenous fertilizer; but it is also used in the production of sulphuric acid. The total value of Canadian fertilizers exported in 1915 was $2,539,789; but this included not only calcium cyanamide, but sulphate of ammonia produced in the bye-product coke-ovens of the great iron and steel plants, and small quantities of other fertilizers.

OIL-WASHING PLANTS AFTER THE WAR.

By "Cricket."

In order to allay any fear there may be on the part of the management of any gas undertaking that oil-washing plant may not be useful after the war, I would like to direct their attention to the remarks made by the Chairman of the Bradford Dyers' Association at their general meeting, as reported in "The Times" on the 1st inst. He pointed out the vital importance of benzol for the dye industry, and said that one of the dangers of the future was found in the possibility of the great petrol companies buying up the whole, or the greater part, of the benzol products in this country in order to prevent or control its competition with petrol. He thought those companies could well afford to do so at a price which would make it quite prohibitive to colour making.

The price of benzol is now controlled by the Government, and the price is only about half its market value. Yet at gas-works where it is extracted from the gas, it forms a valuable additional source of profit. It will be seen that after the war there is likely to be great competition for benzol. It should be sold to the dye industry rather than used as a propellant for motors, even though it will have to be sold to the dye industry at a substantially lower price than it would fetch as motor spirit at prevailing market values. The dye industry is so closely connected with the distillation of coal that it should have every support from us, especially when it is prepared, as pointed out at the meeting referred to, to instantly change, when necessity called, the dye manufactories into explosive manufactories, as Germany was able to do at the beginning of the war. Therefore, for the sake of the protection of this country and its Allies, it is necessary to direct our energies to supporting the dye industry rather than the motor industry. Some gas managements are under an impression that crude benzol from gas-works and coke-oven works will, after the war, make serious inroads, if used as motor spirit, into importations of petrol. Considering that the whole of the coal carbonized per annum in this country is only 36 million tons, even if there were an average extraction of 2 gallons per ton, this would mean that only 72 million gallons of crude benzol would be produced out of a normal annual importation of 200 million gallons of petrol. The probability is that the dye industry, rubber works, cleaning works, &c., will absorb all the crude benzol produced in this country. Moreover, the chief and most important reason for gas undertakings supplying the dye industry with crude benzol is to oust Germany as far as is possible from the monopoly she enjoyed before the war in regard to dyes, and thus keep all the profits from our coal distillation in this country, so that it may become this country's asset instead of Germany's. As England is the largest manufacturer of cotton and woollen goods, and these absorb most of the dyes manufactured, it is very desirable she should at least retain dyes made from her own coals.

It must be recognized that Germany's dye monopoly helped to build her Navy, including the submarines. Moreover, our large annual export to Germany of superior coal helped to build up her fighting forces against us. This must not happen again. A succession of weak Governments such as we have suffered from always ends in war.

Oil-Washing.

It was recently announced in the "Journal" [*ante*, p. 285] that 700 to 800 British gas-works were tar-washing their gas, and that only 80 gas-works were oil-washing, though others were preparing. But taking the present position, the proportion oil-washing is not large, and should be greatly increased in future. The sooner the better.

If the figures quoted in the "Journal" are correct,* from my knowledge of gas-works using the oil-washing process, it would seem that very nearly 50 p.ct. of these works are situated in the southern counties; and this is a sufficient reason for these works being abundantly supplied with the very best gas coal. Even then I consider there should have been by now a larger number of works oil-washing in these counties; but I cannot understand how the rest of the country can have exhibited so little energy. I should be glad to hear that the figures quoted in the "Journal" were incorrect; but, generally speaking, I know that such figures are verified before publication. It is to be hoped, therefore, that now the pressure of winter supply is practically over, gas engineers will lose no opportunity of converting the "C" process at their works into the oil-washing process wherever possible, and especially now that it has been established that the oil-washing process can ensure, on the average, from six to eight times the extraction of crude benzol as results from the "C" process.

Elimination of Naphthalene.

The elimination of naphthalene can be effected at certain works carbonizing Durham coals under certain conditions, in conjunction with oil-washing. It is necessary in the first place to ensure that the gas has been adequately cooled by sufficient condensing plant. This will eliminate the bulk of the naphthalene. It is also necessary for the wash-oil to be cool. The next condition to ensure, is that the oil entering the still of the debenzolizing plant is preheated to between 125° and 130° C., and does not leave the still at less than 110° to 115° C. It has been found that under these conditions, and extraction being performed at not less than 1½ gallons per ton, naphthalene can be totally eliminated from coal gas when Durham coals are carbonized. I consider that, in all probability, the same result would be attained with other varieties of coal.

It has been proved conclusively at a large up-Thames gas-works that, under good working conditions, naphthalene can be entirely eliminated from coal gas. The test used by the chemist at the works there was a fairly severe one, consisting (as it did) in the passing of large quantities of gas through a series of three Wolffe's bottles containing a saturated standard solution of picric acid. The quantity of gas passed through was from 10 to 12 c.ft. per day for over a fortnight, during which time no turbidity of the picric acid occurred; and at the end of the month, using the same solution, only the slightest turbidity was visible, but on test the naphthalene was not estimable in amount. New wash-oil (containing naphthalene in fair amount) when added to the stock of wash-oil, and used in the scrubber, immediately caused the passing of 3 to 5 grains of naphthalene per 100 c.ft., and in one bad instance up to about 8 grains. But, on passing this wash-oil through the debenzolizing plant, it was rendered in a fit condition to extract all the naphthalene from the gas.

It must not be thought, however, that the trouble in regard to naphthalene on the district is at an end. Far from it. It will take some years to cure this, as the naphthalene-free gas has a remarkable faculty for picking-up old deposits in the district mains, especially in the late autumn, and re-depositing them in the service-pipes. A more rapid remedy is, of course, by "oiling" the gas before it issues from the works. But, as to this, I expect readers will soon be in receipt of a *brochure* on the subject, which is engaging the attention of a Special Committee appointed by the Institution of Gas Engineers.

Before leaving the subject of naphthalene and oil-washing, I would like to say that some engineers seem to be anxious to separate the naphthalene from the crude benzol. I can see no advantage in the operation, but several disadvantages. In the first place, distillers, so far as I am aware, have made no objection to naphthalene being in crude benzol—in fact, I have gathered that they prefer it in the liquid state, as it can be better dealt with in this condition in the process of distillation, rather than in the form of a salt. The most important point for consideration, however, is that in the liquid state the price is but little varied per gallon as crude benzol, while if the naphthalene is separated out as a salt it is only worth about a quarter the value. Moreover, if one extracts it, it is simply putting oneself to a great deal of trouble and anxiety to sustain a loss.

Our old enemy—naphthalene—has become a staunch friend and protector of our country—respectively, as a base for dyes, and as a base for a violent explosive.

Coke in Exchange for Coal.

During war-time, it is not sensible to make oil gas; but many of us, owing to the shortage of coal, are obliged to do so. From the economical and national points of view, at all gas-works where explosive materials are being extracted from coal gas—such as phenol, crude benzol, sulphur, concentrated ammonia, naphthalene, &c.—the percentage of coal gas should be 100. In war time, too, the very best bituminous coal should find its way to gas-works. At the present moment there are many thousand tons of coke in stock in London alone which should be used for steam-raising and other purposes, instead of bituminous coal. The bituminous coal so used, if suitable, should be sent to the gas-works, and so reduce or eliminate the manufacture of oil gas. Gas oil comes principally from foreign countries; and gold to purchase it is poured into foreign pockets instead of being used for direct war purposes.

It may surprise readers to know that for every 12,000 c.ft. of oil gas displaced by an equivalent amount of coal gas, there is at disposal for sale over 20 cwt. of coke and breeze. This can best be illustrated by taking a hypothetical case of a small gas-works with plant capable of carbonizing 2 tons of coal per day, but possessing also an oil-gas plant capable of making 12,000 c.ft. of gas per day. If 2 tons of coal per day are carbonized for a consumption of 24,000 c.ft., 22½ cwt. of coke and 3 cwt. of breeze will be made for sale—in all, 25½ cwt. of coke and breeze. But if, for instance, due to shortage of coal, the works has to make half its gas by the oil-gas plant and half by the coal-gas plant, it will require to transfer 8¼ cwt. of coke and breeze from the coke yard to the oil gas plant. As 12¾ cwt. of coke and breeze have been made for sale out of the one ton of coal used to produce half the gas, and from this has to be deducted 8¼ cwt. of coke and breeze to make the other half of the gas required, it follows that there are only 4½ cwt. of coke and breeze left for sale. Therefore, when making 24,000 c.ft. of coal gas, it can sell 25½ cwt. of coke and breeze. But it can only sell 4½ cwt. of coke and breeze when making half the gas by means of an oil-gas plant. Thus, it is easily seen that for each 12,000 c.ft. of oil gas displaced by coal gas, 21 cwt. of coke and breeze are available for sale.

Labour.

I strongly advise readers to avail themselves of "Army Reserve Munition Workers," as it must be remembered these men are offered not only as substitutes, but also for the reinforcement of labour. Of a number just offered to me, there appear to be some likely to suit the work, especially as I had asked for men used to gas-works; and even in one case, where a man offered is not used

* It may with confidence be taken that they were approximately so at the date of publication.—Ed. G.J.

to gas-works, I think it is possible to employ him, and give him congenial work which should make him feel quite at home. The man was formerly a milkman. We may find him useful in the sulphate plant—mixing up the milk of lime!

If readers will take the trouble to carefully peruse a stores list for one or other of the large London stores they will see how many non-essential goods are still being manufactured. They will also, I think, come to the conclusion that there are not only thousands, but millions, of men, women, boys, and girls who can be released for war work, as well as valuable machinery. No doubt among these millions of people who can be released there would be found a percentage for the Army. These should be ruthlessly combed out, rather than that essential men should be withdrawn for the services from such a vital war industry as that of gas manufacture, from which high explosive material is derived, and without which it would be impossible to carry on the war.

GAS-WORKS IN WAR TIME.

A REVIEW BY MR. E. KORTING, THE GENERAL MANAGER—"ANTE BELLUM"—OF THE BERLIN WORKS OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

[Abstract Translation from the "Journal für Gasbeleuchtung" for Jan. 6 and 13, 1917.]

(*Concluded from p.* 455.)

Maintenance of Supply.

The first rule to be observed by the gas engineer, whether in time of peace or time of war, is that the supply of gas must be properly maintained at all times. In peace time, the staff consists only of trained and trustworthy men, and a sudden unforeseen interruption of gas supply is in the highest degree improbable. In war time, however, serious accidents on the works, such as the recent one at Dessau, are more likely to occur. How they can best be guarded against is another problem; but malice, folly, and spite can find many possibilities of doing mischief on a gas-works. The Dessau experience has shown that a town may be deprived of gas for days or even weeks, and the emergency measures to be taken in the event of a sudden catastrophe should be settled somewhat as follows: On receiving prompt warning from the police, fire-brigade, or school authorities, each consumer should immediately turn off the meter-tap and all gas-taps in the house, and the gas-works, at the same time, should reduce the pressure in the distributing mains to 1-10th to 2-10ths. The stock of gas in the holders will suffice to maintain this pressure for a long time; and the danger of an explosive mixture of gas and air being formed in the mains will be guarded against. "Thank heaven accidents of this kind are rare even in war time," adds Mr. Körting.

More commonly, however, chronic shortage of gas may arise for a longer or shorter time, though many hostile countries are worse off in this respect than Germany, which indeed possesses ample coal even for export, as well as the largest fire-brick and gas engineering firms, and a surplus of other materials. But, owing to the extension of her borders, the country is suffering from shortage of locomotives and wagons for internal transport, and consequently the stock of coal at particular gas-works at times runs low. This has been the case particularly with works close to the war zones—*e.g.*, in East Prussia, in 1914; in Poland, in 1915; and in Transylvania, in 1916. Some limitation of coal traffic has been unavoidable, and gas-works, as large users of coal, ought to consider the question whether it is to the general benefit that gas consumption should be greatly reduced.

That a diminution of gas consumption for heating purposes would effect a reduction of railway traffic is an absolute fallacy. It can be shown that the available space for coal freights can be better utilized by applying gas in place of coal in domestic houses, because the heat efficiency of the gas-cooker is about 60 p.ct. in comparison with about 10 p.ct. for the coal-range. Further, in Berlin, among other places, large quantities of foundry coke are obtained from Westphalia and Silesia for use in central heating installations; and, if the use of gas for heating were restricted, more of such coke would be required. But from the fact that a bushel of foundry coke weighs about 40 lbs., and a bushel of gas coal about 66⅔ lbs., it will be seen that if gas coke were used to replace foundry coke for central heating, better use would be made of the available space for freight of coal or coke. Thus if the make of gas is taken at only 11,500 c.ft. per ton, its net calorific power at 470 B.Th.U. per c.ft., the calorific value of gas coke at 12,500 B.Th.U., and of foundry coke at 13,850 B.Th.U. per lb., the efficiency of the ordinary gas-cooker at 60 p.ct., the duty from coal in the kitchen range at 10 p.ct., the calorific value of tar at 15,650 B.Th.U. per lb., the duty obtainable from tar as fuel at 80 p.ct.—then a wagon load of 10 tons of gas coal would need the following equivalents of other coal to render the same service:

For the gas:	$\frac{10 \times 11{,}500 \times 470 \times 0{\cdot}6}{2240 \times 12{,}500 \times 0{\cdot}1}$	= 11·58 tons of household coal.	
For the gas coke:	$\frac{5 \times 12{,}500 \times 66{\cdot}5}{13{,}850 \times 40}$	= 7·50	,, ,, ,,
For the tar:	$\frac{0{\cdot}4 \times 15{,}650 \times 0{\cdot}8}{12{,}500 \times 0{\cdot}7}$	= 0·57	,, steam ,,
Therefore, 10 tons of coal on gasification are equivalent to		19 65	Tons of household and steam coal.

It is obvious from this rough calculation, which is due to Herr Kobbert, the Manager of the Königsberg Gas-Works, that restriction of the use of gas for heating purposes would be a distinct blunder. With gas or current for lighting purposes, however, it is another matter, as all reduction in consumption means less coal to be transported. The introduction of "Summer Time," and the restrictions on lighting in the winter, must, therefore, be accepted by the gas industry as fulfilling their purpose. Having regard to the preponderance of gas consumption for heating purposes, no very great economy of gas may be expected from the closing of shops in Germany at 7 o'clock, which is a measure not to be mentioned in the same breath with the contemplated reduction—to one-third—of the coal supply to gas and electricity works in France.

Shortage of coal at particular gas-works may necessitate drastic steps. The rule should be that a little gas is better than none, and gas of low calorific power is better than a short supply. Acting on the first idea, the town of Brassó (Cronstadt), in Hungary, decided on Oct. 31 last, in consequence of the interrupted coal supply, to make each consumer pay at the rate of £2 7s. per 1000 c.ft. for all gas consumed for lighting in excess of half his previous consumption in the same period, and at the same rate for gas consumed for heating purposes in excess of two-thirds the previous consumption. Each consumer, however, was to be allowed up to 530 c.ft. a month at ordinary price, irrespective of his previous consumption. There are numerous examples of the "stretching" of gas, either by the addition of blue water gas up to one-third of the mixture, or by pulling in a smaller proportion of flue gases or producer gas. The dilution of the gas may also be effected by the use of poorer grades of coal; but in Germany it is not lack of good coal, but insufficient means of transport, that causes shortage on gasworks. Elsewhere it is otherwise, as is shown by the fact that difficulty of chartering steamers with coal to South America has compelled the Primitiva Gas Company to gasify over 7000 tons of wood a month. When the stock of gas runs so low that the holders are grounded, the pressure in the district falls so that no one can use much more gas; but as the exhausters are always pumping into the holders, a dangerous vacuum cannot be produced. At one place in the field of war up to 50 p.ct. of water gas was first added to the coal gas; but as the stock of coal ran out, the pressure was greatly reduced, and finally the consumers were cut off in turn.

Effects of Debenzolizing.

Debenzolizing gas reduces its calorific power, which cannot always be compensated for—with the present supply of coal—by reducing the make of gas per ton, while discontinuance of the addition of blue water gas would alter the specific gravity of the gas supplied. The gas consumer has learnt to be content with the "war" gas. A troublesome and continuing side-issue is the occurrence of stoppages through rust in pendants and house services. The inner walls of the pipes were formerly oily; but now they are dry as dust, and their coating of rust readily falls away and blocks the gas passage. Naphthalene troubles have been more transitory; being due to the shifting of naphthalene in the distributing mains by the gas which is virtually freed from naphthalene by the debenzolizing process. In one case the naphthalene stoppages trebled for a time after the introduction of debenzolizing in September, 1915; but by the following January they had fallen again to their normal figure. A practical means of getting rid of naphthalene obstructions in trunk mains is afforded by an apparatus which can be put together on the works. It consists of a portable closed tank filled with benzol first-runnings, and connected by flexible metallic hose about 65 ft. in length, with a Körting sprayer. A 1½ in. or 2 in. hole is made in the main, the hose is passed through the hole, and the contents of the tank are forced in by pressure, which is conveniently afforded by a cylinder of carbonic acid. The benzol first-runnings completely remove the naphthalene obstruction, and are pumped out again from the nearest syphon pot.

Staff.

The outdoor staff in particular suffered through the drafts to the colours, because it had expanded greatly since 1900, and therefore consisted largely of young men. Of the permanent staff in Berlin, there were left: Mainlayers, 39 out of 76; public lighting department, 82 out of 216; private consumers' department, 166 out of 635; while of 101 officers, only 37 remained. To replace these losses, there had been introduced 29 male and 8 female deputy officers, and 215 male and 231 female workpeople.

New Services and Gas Consumption.

The district in Berlin served by the Imperial Continental Gas Association had been fully exploited in peace time, and the cessa-

tion of building which followed the outbreak of war prevented any appreciable increase in the number of ordinary meters supplied. But the scarcity of petroleum forced those of the lower classes who were not already gas consumers to fall into line; and there was an increase in two years of 18 p.ct. in the number of prepayment meters provided. The number of new consumers as a whole was distinctly fewer than in two years in peace time. The price of gas was unaltered; and the direct effect of the war on gas consumption is therefore better indicated in Berlin than in places where there have been alterations in price. In the second half of 1914 and the first half of 1915, there was a considerable fall in consumption, owing to the breaking up of households and the stoppage of works. Then war demands began to tell, and the upward movement has since continued, with a slackening only when "summer time" was introduced in 1916.

In Berlin there has been no lack of consumers' meters; and it has been unnecessary to supply gas at a fixed charge per month according to the number of burners fixed. The experiences gained elsewhere with the latter system have been instructive, and ought to be published. Apart from connecting and disconnecting meters as required, the work of the outdoor staff has been restricted to the most essential operations, such as the pumping-out of syphon pots, supervision of automatic hot-water apparatus, &c.

Public Lighting.

Early in the war many of the local authorities required the public lighting to be reduced by half. The debenzolizing of the gas caused many obstructions of service-pipes to street lamps, through naphthalene and rust. There have been numerous instances of the membranes in the "Bamag" automatic lighting appliances becoming unsound, owing to the liberal use of benzol first-runnings for getting rid of naphthalene obstructions. Lanterns which were put out of use were found very frequently to have been wantonly damaged or destroyed, and ultimately the lanterns of all lamps not regularly lighted were removed. The public lighting staff underwent great changes. Women were successfully employed to attend to incandescent burners.

Office Changes.

The staff of book-keepers, store-keepers, salesmen, cashiers, &c., numbered 285 men and 1 woman in December, 1914. Of these men, 105 remain, and additions have been made of 206 men (ages 16 to 74) and 27 women to replace men called up. This increase in numbers, which in many cases has been attended by lengthened working hours also, has been necessary because the average efficiency of the new employees is far below that of the old staff. The new employees also change frequently, and much time is spent in teaching the work to them and in revising their blunders. Even those who have been employed for a considerable time do not take the same interest in their work as the original permanent employees. Moreover, gas accounts are not paid so promptly as hitherto; and many prepayment meters are broken open. Generally, arrears and money taken can only be recovered by accepting instalments. Nevertheless, as a whole, the auxiliary staff has given satisfaction, thanks to the exercise of care in selecting the new hands.

Increased Pay.

Members of the office staff receiving less than £150 a year had an increase of 6 p.ct. on their pay in 1915, and on April 1, 1916, a further increase of 4 p.ct. Those receiving over £150 a year had one supplement of £10 in 1915, and three of the same amount in 1916. Temporary members of the staff have been given an increase of 12s. a month since July, 1916.

In December, 1914, fitters and mechanics received an increase of 10 p.ct. In February, 1915, all regular workmen received an additional 0·7d. per hour, and casual labourers 0·6d. per hour. On July 1, 1915, there was an addition of 0·6d. per hour to all; on July 1, 1916, to regular workmen 0·8d., and to casual labourers 0·7d. per hour; and in November, 1916, to regular workmen 1·3d. and to casual labourers 1·2d. per hour.

Up to August, 1916, officials serving with the Colours received their full salary; but from Sept. 1 last unmarried officials have received only one-third of their salary, and married officials 70 p.ct., with an additional 5 p.ct. for each child, up to a maximum of 80 p.ct. Married workmen receive 14s. a week, and 1s. 6d. for each child. At Christmas they receive 20s., and at that time only the unmarried workmen receive a gift of 40s.

Mantles among Prohibited Imports.—A Proclamation dated Feb. 23 prohibits as from that date the importation into the United Kingdom of various articles—exception being made in respect of such goods as are imported under licence of the Board of Trade. Included in the list are incandescent gas-mantles.

Shale Oil in New Brunswick.—Mr. W. E. Anderson (the Imperial Trade Correspondent at St. Johns) reports, says the "Board of Trade Journal," that increased development in connection with the oil-shale deposits of Westmoreland County is looked for within the next few months. An exhaustive survey of this deposit was made about two years ago by one of the foremost United Kingdom authorities on oil. He stated that the New Brunswick shale was capable of producing 33 Imperial gallons of crude oil per ton of shale, and 60 lbs. of sulphate of ammonia. It is believed that there is already sufficient shale available to employ five plants, each of a capacity of 1500 tons a day, for fifty years at least.

SIMPLIFYING DISTRIBUTION CALCULATIONS AND PROBLEMS.*

These are labour-saving days; and the engineer having charge of a gas distribution system will not be averse to an additional handy office companion which will assist him to lighten calculations and solve problems in connection therewith. Mr. W. Marsh Hampton, B.Sc. (Lond.), one of Mr. Hubert Pooley's assistants in the Leicester Corporation Gas Department, has accomplished what we believe will be generally agreed to be an excellent piece of work in producing what will be known as the "Gas Distribution Diagram," together with an explanatory brochure, from which one can easily see how to use the chart, and obtain from it multifold advantage. By this, one individual has done close and heavy work, which will give relief to many. Alignment diagrams or charts are no new thing in America and on the Continent in connection with water distribution. For the same purpose, they have had limited application in this country, but are now better known through the introduction last year, at the meeting of the Institution of Water Engineers, by Mr. D. Halton Thomson, M.A. (Cantab), of one in which he had incorporated a new factor. Not only in connection with water distribution, but for storage capacity, alignment diagrams have been employed abroad. In our issue for Sept. 19 last (p. 562), a small chart was reproduced from the American "Gas Age," by which approximate computations could be made of the tons of coal a bin would hold; and as recently as Jan. 9 another appeared, from the same source, for the calculation of the weight of steel in tanks. Hence Mr. Hampton does not claim any originality for the principle of a graphical chart of the kind, but he does claim the adaptation to the distribution of gas.

The diagram is applicable not only to single mains, but to compound mains, or systems of mains; and, by the graphical representation, one can simply and rapidly ascertain the relation of the various factors which go to constitute the problems which the engineer desires to solve in connection with gas distribution. The diagram is based on Dr. Pole's formula, and for bends Cripps'. The chart comprises eight vertical figured lines, headed (1) Length of Pipes in Yards, (2) Back Pressure due to Bends, (3) Diameter of Pipes in Inches, (4) Factor (Series and Parallel), (5) Specific Gravity, (6) Velocity in Feet per Second, (7) Fall of Pressure in Inches of Water, and (8) Quantity (Cubic Feet per Hour). The brochure explains, and gives examples of, the method of using the diagram for simple and compound systems. Naturally, we cannot make the same critical check of the diagram that the engineer can do with the given conditions of his own distribution system; but, in a preface to the description, Mr. Pooley testifies to the accuracy of the diagram, and the simplicity and expedition with which it can be applied. He has had many problems checked by the Leicester Gas Distribution Department; and "in no case was the difference between the calculated result and the diagram result worth the slightest consideration." That is good testimony, which can be verified by other engineers at the small cost (5s.) at which the diagram with the explanatory brochure is published. Mr. Pooley says the diagram should be invaluable to the "scientific engineer." The limitation implied by the use of the word "scientific" is not an actuality; the diagram will be found invaluable not only to the scientific engineer (no "engineer" should be otherwise), but to the man responsible for gas distribution who has hitherto carried out his work on purely empirical lines. The diagram and the brochure should help to lift such a man from the error of his ways. The examples show he would have little difficulty in bringing calculated work to bear upon the problems with which he may be faced; for the chart is as simple to use as a special slide-rule. The diagram is plainly lithographed on stout paper; and the explanatory brochure is clearly printed.

We believe—knowing the value that has been derived from similar charts in other branches of engineering—that every gas engineer will avail himself of the publication of this diagram to test for himself the intrinsic merit of Mr. Hampton's work. And probably once tried, the diagram will always be used.

* "Low-Pressure Gas Distribution: A Description of a Rapid Method of Graphical Solution of Problems relating to Mains and Systems of Mains"—with a working diagram. By W. Marsh Hampton, B.Sc. (Lond.), of Leicester. London: Walter King. Price, free by post, 5s.

The Ceramic Society and Refractory Materials.

As already intimated in the "Journal," the Refractory Materials Section of the Ceramic Society are meeting to-day in the lecture room of the Leeds University Department of Coal, Gas, and Fuel Industries, when, in addition to the proceedings previously named, there will be an evening lecture by Prof. John W. Cobb, B.Sc., on "Temperature Measurements in Clay-Works Practice." The next meeting of the section will be held during May, in Stourbridge, when two of the papers to be contributed will be by members of the Society of British Gas Industries—Major Thomas and Mr. G. H. Timmis, dealing with the "Scientific Management of Brick-Works" and "Fire-Clay from a Manufacturer's Point of View."

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

The Forty-Second Annual Meeting of the Association was held last Thursday, at the Royal Society of Arts, Adelphi, W.C. The attendance of members was excellent. During the transaction of the formal business, the retiring President (Mr. W. Doig Gibb, of London) occupied the chair; being succeeded later, as will be seen, by the new President (Mr. W. N. Westlake, of Exeter).

Minutes Confirmed.

The President (Mr. Doig Gibb) stated that the minutes of the last meeting consisted of the report as published in the "Gas Journal;" and he presumed that they would be taken as read. He therefore proposed their confirmation. [Agreed.]

Annual Report of the Committee.

The annual report of the Committee was next presented. It gave an account of the year's proceedings; and in its final passages it recorded, with the deep regret of the Committee, the death of Sir Corbet Woodall (London), Mr. James L. Chapman (Harrow), and Mr. F. F. Farrand (Ryde). It also mentioned that eighteen new members had been elected, and that four members had resigned. The total amount of the subscriptions received in respect of the year was £101; and the total expenditure was £120. At the March meeting a donation of £10 10s. was made to the Benevolent Fund of the Institution of Gas Engineers; and Mr. W. T. Dunn, the Honorary Secretary, wished the thanks of the Committee of Management to be conveyed to the members of the Association for their most acceptable gift.

The President proposed that the report be adopted.

Mr. C. F. Botley (Hastings) seconded the motion, which was unanimously carried.

New Members.

Proposed by the President, and seconded by Mr. A. A. Johnston (Brentford), Mr. Walter Parker, of Ryde, and Mr. L. A. Rumble, of Reading, were added to the roll of members.

The Late Mr. J. L. Chapman.

The President said he had intended, on submitting the report of the Committee for the approval of the members, to mention the death of Mr. J. L. Chapman, of Harrow. He thought his memory deserved some special mention from the fact that he was one of the original members of the Association, and one of the five Hon. Secretaries who had so ably carried on the work for which the Association was formed. In the name of the President and the Committee, a sympathetic letter had already been sent to Mr. Chapman's relatives by their Hon. Secretary, Mr. H. C. Head. But he (the President) did not wish the meeting to pass without some reference to the appreciation which the members generally had for Mr. Chapman, because of his very long and intimate association with the organization.

The Retiring and New Presidents.

The President said his year of office now came to a close; and the only duty that remained for him to perform was to introduce to the members their new President, Mr. W. N. Westlake, of Exeter. He needed no introduction at his (Mr. Gibb's) hands; but there was one point he might specially emphasize. It was that, as the President for the time being might be said to belong to London, it was with genuine pleasure that he welcomed as his successor a President who belonged to a southern district so far away from London. The western portion of the southern district had lately shown marked vitality in the way of forming a Commercial Section of their own. For other reasons, they also rejoiced to know that their President was a member of one of the Western Counties. Later on, he would probably be suggesting the arrangements for the May meeting. If the new President should in his wisdom think fit to invite the Association to Exeter, he (Mr. Gibb) thought it was up-against the members, even though it might be at some inconvenience to themselves, to try their very best to put in an appearance there, if only to show that the southern district headquarters were not necessarily London, but were in any part of the southern district where the President for the time being was residing. He asked the members to extend a hearty welcome to the President, and to give him the same loyal support that they had rendered to himself. For all this support, he thanked them.

[Mr. W. N. Westlake (Exeter) then took the chair, and received a very hearty welcome.]

The President said he was exceedingly grateful to the members for the cordiality with which they had received him as their President. It was only a repetition of the kindness he had invariably experienced from the first day he was privileged to come among them. The members might rely upon him doing his best to maintain the traditions of the office to which they had elected him. It was not an easy job, because of the brilliant men who had passed the chair before. But with the assistance of the members, they might depend upon it that he would do his utmost to carry out to their satisfaction the work that fell upon him. His first duty was to propose a vote of thanks to the Past-President for his work in the chair. The proposal hardly needed any words in support; but he would like to refer to one or two points. The year had been one of considerable trouble. It had been a year of very hard work for most of them; but probably, if the actual fact could be ascertained, Mr. Gibb had had to work the hardest of them all. Those who had been engaged on the Committee work of the Association during the twelvemonth knew how awkward and difficult it had been at times for their Past-President to attend both the Committee and the ordinary meetings. But he had been there; and it had often occasioned him some considerable effort. Most of them would remember the Presidential Address that he delivered to them a year ago. It was full of broad thought; and it was a great pleasure, he was sure, for all of them to listen to it. There was the most successful meeting at Beckton in May; and there was also the interesting discussion on oil-washing in November, which was opened by a paper from the President. These three things marked the President's year of office; and they stood out in the history of the Association. He moved a vote of thanks to him for what he had done as President.

Illness of Mr. Halford.

Mr. W. E. Price (Hampton Wick), in seconding, said the members—knowing the busy man Mr. Gibb was—were very thankful that he had seen his way to give them so much time as he had done during his year of office. They very much appreciated the work he had done for them. Their Past-President was a man of great energy; and he had not yet found the end to the scope of that energy. He had taken on still more work. The members would be sorry, he (Mr. Price) felt sure, to hear that a gentleman whom they now knew well—Mr. F. L. Halford—was laid aside by serious illness. They were all grieved at this. But modesty would prevent Mr. Gibb saying what he (Mr. Price) could say—that he had undertaken, or was looked to, to assist as much as he possibly could in the work that Mr. Halford had been doing. They were pleased they had a man among them of whom they thought so highly as Mr. Gibb to take the position that unfortunately Mr. Halford had to give up, they hoped, only temporarily.

Mr. Gibb said he thanked the members very much for all the kindness that had been shown to him during his year of office, and the President and Mr. Price for their kind remarks. It was very good of Mr. Price to mention what he (Mr. Gibb) was trying to do. But he thought he was doing no more than each one present. He was only carrying out for the nation what work was within his power; and he presumed that this was what they were all doing. If his release from regular employment had enabled him to do more than possibly some others, then it was his good luck; but any other gentleman in the room with the same opportunity would have done the same. So far as his health allowed, they might rely upon him helping the Government, and incidentally looking after the interests of the gas industry, as far as was in his power. The Southern Association had probably seen more of Mr. Halford than other Gas Associations; and if it was not improper for a colleague to suggest it, he thought perhaps Mr. Halford would appreciate on his bed of sickness a message from the meeting.

Mr. Samuel Glover (St. Helens) proposed that members should send a message to Mr. Halford expressing their sorrow at his illness, and hoping that he would soon be restored to health and strength.

Mr. C. F. Botley (Hastings), in seconding, said that anybody who knew Mr. Halford, and had seen how he had worked, could not but feel that a loss was being suffered, even though they had such an excellent "backer-up" as Mr. Gibb to take on the duties.

The President said he should like to support the proposal. He had been brought into personal contact with Mr. Halford in the course of the work upon which they were now specially engaged; and he had received the utmost kindness and assistance from him in regard to anything he had brought before him. He agreed that a message of deep sympathy and regret, together with the hope of speedy recovery, should be sent to him.

Mr. D. H. Helps (Reading) suggested that a telegram should be sent to Mr. Halford direct from the meeting.

This was agreed to.

The Hon. Secretary (Mr. H. C. Head, of Winchester) at once gave effect to the decision.

Representative on the Council of the Institution.

Mr. Gibb said he must once again intrude himself upon the members, in order to propose the election of a representative of the Association on the Council of the Institution. He wished specially to do this, as Mr. Westlake was good enough to suggest that, as his (Mr. Gibb's) position on the National Gas Council depended to some extent on him being a member of the Council of the Institution, he would be only too glad, in the present extreme circumstances, to stand-down, and allow him (Mr. Gibb) to be the representative of the Association on the Council for another year. He very much appreciated the President's kind offer; but, at the same time, he did not like to deprive Mr. Westlake of the dignity that representation on the Council conferred. By the kindness of some of the members of the National Gas Council, he found it possible to assure Mr. Westlake that, coming off the Council of the Institution, would not interfere with his position on one or two of the Committees of the National Gas Council, owing to the power of the Committees to co-opt members upon them. This removed the only difficulty that was was in the way of Mr. Westlake accepting office. Personally, he (Mr. Gibb) would have been sorry if Mr. Westlake had not had his turn on the Council of the Institution. With gratitude for his offer, and with pleasure, he now moved that Mr. Westlake should, during next year, be the representative of the Association on the Council of the Institution.

Mr. Robert Beynon seconded the motion, which was heartily agreed to.

The President, having thanked the members for the additional honour they had conferred upon him, proceeded to deliver his

INAUGURAL ADDRESS.

Gentlemen,—I must again thank you for the honour you have conferred in electing me President of the Southern District Association. It is one which I highly appreciate, and it will be my aim to merit the confidence that you have reposed in me, and at the end of my year of office I hope to be able to hand the chair on to my successor with its prestige undiminished and its lustre untarnished.

THE WAR.

I had often hoped, too, that on this occasion I might have been able to express satisfaction at the victorious conclusion of the great war. But this cannot be. The strife among most of the great nations of the world continues; and the issue is still undecided as to whether they are to have freedom to develop their national lives, or whether they are all to be crushed into one common, degraded, and standardized form, for the purpose of building-up and maintaining a world-wide tyranny. I think, however, the clouds are breaking and passing away. The gigantic preparations of years have failed in their object. The issue was meant to be decided by quick crushing victories over unready nations by a prepared foe. These blows were parried; and now I hope the time is near when the united and co-ordinated efforts of the Allies will bring about a complete victory, so that the nations of the world will be free once more to devote their energies to furthering the peaceful progress and happiness of mankind.

In this conflict the gas-industry has taken its full share of the national burden. The difficulties of the past two-and-a-half years have never been surpassed. Coal and other materials have been hard to get; prices have risen enormously; and staffs and men have been so depleted that the strain imposed upon those left behind has almost reached breaking point. Unlike many other businesses, the great bulk of the work has had to be kept going all the while, and also important alterations made in the manufacturing process to meet the imperative demands for supplies of explosives. Yet amid all the trials and difficulties, there have been few, if any, failures; and I think we may be justly proud of the part the industry has been called upon to play in the national cause. It has responded nobly; and when peace once more reigns, it will be numbered among the honourable company of those who have given of their life-blood to achieve victory, and who also have come out of the struggle poorer (at any rate, in material wealth) than when they entered it.

THE OUTLOOK.

I do not wish, however, to dwell at any length upon these past and present difficulties. I would rather ask you to think of larger things—such as the great changes affecting the industry which the war has brought, and will bring, about. While we are fighting our way to victory, we are passing through a complete revolution in our whole industrial system. The great bulk of the factories and workshops are having their products and output subordinated to the national needs. A very large number are under Government control. Everywhere production is being speeded-up by the official whip. Old methods have had to be discarded, and obsolete machinery scrapped. New factories have grown up like mushrooms, equipped with the very latest and most approved plant for rapid production. All this will probably mean that, after the war, the efficiency level in our manufacturing system will have been considerably raised, and we shall be in a better position than ever to cope with the huge volume of business that must inevitably come. So this gigantic clash of arms, which we are now passing through, is going to bring about some beneficial changes; but how much better it would have been if this relentless purging was accomplished without being accompanied by so much human misery and distress.

It has not been necessary to have such a drastic overhaul in the gas industry. On the whole, the war found it well equipped, and only comparatively minor additions and adjustments to the existing plant have been required to meet the national emergency. But we cannot stand still. There is a critical period approaching; and it will be well if we take stock of our position now, and make our plans for participating in the national reconstruction that must come when the war is over. We shall not be able to go back to the old conditions. The war will bring about changes in the gas industry, as well as in almost every other business. These changes—particularly when they are to the national advantage—should be welcomed and facilitated, because only by so doing can the present position be maintained and further improved.

To discuss all the questions which the war has made prominent affecting the industry, and the changes that may be brought about, would be a much too large a task for this address; but I will just ask you to think with me about one or two of the most important.

FUEL ECONOMY.

One of the questions that has been forced on our attention by the war is that of fuel economy and the conservation of our coal supplies. Coal is vital to the gas industry. It is more than that. It is the foundation upon which the whole industrial prosperity of the country has been built. The available quantity of coal is not inexhaustible; so all wasteful use of it should be avoided. Prof. W. A. Bone, in the lectures on "Fuel Economy and Utilization of Coal" which he delivered at the Royal Institution last year, gave the estimated percentages of the coal reserves for the principal countries as follows:

	Per Cent.
United States	51·8
Canada	16·4
China	13·5
Germany	5·7
Great Britain	2·6
Siberia	2·3
Australia	2·2
Russia	0·8

Thinking over these figures, no one can fail to notice the position of Great Britain, and how small our portion of the total reserves is. It need not at the moment cause us any alarm; but the future does give cause for anxiety. Prof. Bone sums up the question in these words:

> The serious aspect, however, of the coal question for Great Britain is not how long can our reserves possibly last, having regard to the probable long continuation of the present upward tendency of our annual outputs (which is, after all, only an academic question), but how long we can continue to get the available coal at a cost which will not place us as a nation at a disadvantage relative to our nearest competitors. From this point of view, the achievement of all possible economies, not only in the getting but also in the transporting and utilization of coal, is of the greatest possible importance, especially in view of the heavy burdens which war taxation must inevitably impose upon commerce and industry. I will, therefore, invite you to consider with me the immediately important question of how far we are now making the best use of the coal which we annually consume, and in what directions we may expect to realize much needed economies, either by the adoption of improved methods or by the better control or supervision of existing ones. For it cannot too often be insisted that the true line of economy lies not so much in the direction of imposing artificial restrictions on exports or domestic supplies, as in an insistence upon the coal raised being utilized to the best and fullest advantage by every class of consumer.

The gas industry is a consumer of coal to the extent of about 18 million tons per annum; and it will be its duty to see that this large quantity is utilized to the best advantage.

It may be useful if I try to indicate to what extent progress has has been made in economizing coal in the manufacture of gas during recent years. This may be tested by comparing the average quantity of gas produced per ton of coal as shown by the Parliamentary Returns for all authorized undertakings, as follows:

	Coal Carbonized. Tons.	Gas Made. C.Ft. Thousands.	Average Make per Ton. C.Ft.
1905	14,480,325	155,167,932	10,716
1908	15,394,307	168,289,876	10,932
1911	15,635,012	180,931,414	11,572
1914	16,684,087	194,290,031	11,645

It will be noticed that the average make per ton increased from 1905 to 1914 by 929 c.ft., which represents a saving of nearly one and a half million tons of coal annually. This is a considerable advance, and a substantial contribution to the conservation of our coal. But there is no reason why the effort should not be continued. There are still some carbonizing plants in use which are inefficient; and they should be scrapped with as little delay as possible. Each undertaking must proceed according to its own conditions; but all should aim at improvement. In the coming reconstruction after the war, this is one of the economies that will be of great value; and, good as the past results have been, an effort should still be made to accelerate the progress in the future. I think the nation will expect this of the industry.

CARBONIZING PLANT.

In connection with this question, I thought it might interest you to know what has been done at Exeter in recent years towards securing economy in coal consumption. The new plant put down consists of coal-handling machinery and an installation of continuous vertical retorts.

The coal-handling plant is an electric mono-rail telpher running on a track 830 ft. long around three sides of the retort-house, over coal-stores capable of storing 6000 tons of coal. It is arranged on the top-rail principle, rendering it easily renewable, and supported by lattice girders and trestles. There is a double track over the large coal store. The height of the track is 40 ft. above the ground-level, which enables the telpher and one-ton grab to clear the roofs. The generating plant consists of one 35 H.P. gas-engine direct-coupled to a generator running at a speed of 250 R.P.M. There are two pits for tipping coal from end-tip wagons, which are lifted by two electric hoists. The coal, after being tipped, is picked up by the grab and distributed anywhere in the store through moveable openings in the roof, or dropped into the coal-hopper for feeding the elevator to the vertical retort benches. The coal stored can be picked up again by the same grab, and delivered to the hopper of the elevator. Coal can thus be placed into store and taken out again just as is found necessary. The plant requires one man, and was first used in 1911. It can handle 20 tons per hour with a run of 600 ft. out and back, and has worked quite smoothly and without a breakdown. The working cost is as follows:

1911-16 (5¾ years).	Coal handled			218,973 tons
	Gas at cost	£259	8 0	
	Wages	510	19 10	
	Repairs, oils, &c..	92	4 7	
Total cost of working for the period				£862 12 5
Cost per ton of coal handled				0·945d.

Painting is not included in this cost.

The vertical retorts are of the continuous type, and are so well known that I need not trouble you with a detailed description. There are five benches of eight retorts each, or forty retorts in all. The retort-house is a steel frame filled with 4½-in. brickwork. An automatic weigher is fixed immediately over the coal crusher, so that the quantity of coal used is accurately recorded. The coke

is removed by a travelling crane with a 40-ft. jib and tipping skips. These retorts are not sufficient for our winter make; the remainder of the gas being produced by hand-charged regenerator horizontal benches. The year's working will, therefore, not give the results from the vertical benches. But for the four months, July to October, 1916, inclusive, the vertical benches were worked alone; so I am able to give you definite returns over a prolonged period. Any plant can be tuned-up to give excellent results for a twenty-four or a forty-eight hour test; but the real efficiency is what can be maintained over a good working period. In November, I had to start some horizonal benches. The working result is as follows:

	Tons.	Cwt.
Coal carbonized—Somerset	4208	10
Yorkshire	4369	0
Total	8577	10

Gas made	120,299,000 c.ft.
Gas made per ton	14,024 c.ft.
Illuminating power, No. 2 burner	14·75 candles
Calorific value	507 B.Th.U. gross
B.Th.U. per ton of coal	7,110,168
Coke and breeze for sale (dry)	11·66 cwt. per ton coal carbonized
Naphthalene	6·25 grains
Sulphur	12·5 grains
Carbonizing wages—	
14 men for four months	1·001d. per 1000 c.ft. made
14 men, October only	0·83d. ,, ,,
Ash in Somerset coal	8·5 to 12·6 p.ct.
Ash in Yorkshire coal	3·42 to 4 p.ct.

All coal weighed in an automatic weigher.

The quality of the coal supplied during the past twelve months must be taken into consideration when comparing these results with pre-war working. The wages of men include coal from elevator hopper to coke in yard.

Four benches only were in operation for the first ten weeks, making sufficient gas to meet the demand. In October all the benches were at work with the same number of men; and this month gives true labour costs for the whole installation.

The heats maintained were moderate, as follows:

Combustion Chamber.	Average Heats of the Whole Benches taken at One Time.
No. 1 Bottom	2070° Fahr.
,, 2	2127° ,,
,, 3	2152° ,,
,, 4	2169° ,,
,, 5	2187° ,,
,, 6	2174° ,,
,, 7	2181° ,,
,, 8	2160° ,,
,, 9 Top	2077° ,,

During a corresponding four months immediately previous to the installation of the vertical benches, the average make with hand-charged horizontal regenerative settings was only 11,448 c.ft. per ton; so a very considerable advance has been made. In 1912 our average make per ton of coal was 11,334 c.ft., whereas the average make per ton of the combined verticals and horizontal benches in 1916 was 13,082 c.ft. The class of coal used was approximately the same. The improvement in production represents an economy of coal to the extent of over 5000 tons, or 13 p.ct. per annum, calculated on the output of gas for 1916. This is a help towards the conservation of our coal supply—an object which the gas industry must more than ever keep in view.

RESIDUAL PRODUCTS.

Another important change which the war has brought about, and which is going to have very considerable influence on the future of the industry is the enhanced value of what we still call the residual products. But I think this term is becoming obsolete. Just as we have passed from merely being suppliers of light to providers of light, heat, and power, so we are gradually emerging into manufacturers of gas, coke, tar, sulphate, benzol, and other chemical products. The gas-works of to-day is gradually but surely being more and more regarded as the place for the economical utilization of coal—where all products are equal and none residual. Its sphere of usefulness has been greatly enlarged by the war; and a larger sphere still awaits it in the future. Within the industry this view has long been held and advocated; but it has taken a gigantic war to thoroughly impress it on the public mind.

COKE.

Just consider first the importance of coke. It is a smokeless fuel which in a great many cases could replace coal, and so prevent waste of valuable products which at present pollute the atmosphere. This aspect of the fuel question has been fully illustrated by the first report of the Committee for the Investigation of Atmospheric Pollution recently issued, and which will well repay perusal. A series of tests was made to ascertain the quantity of the atmospheric impurities; and they were collected in standardized gauges placed on the ground level in open spaces free from abnormal dust. Everything falling in the gauge was carefully preserved, tested, and weighed. The results were astonishing. In the twelve months ended March, 1915, the tests showed that the quantities of solid matter—soot, tar, ashes, &c.—which fell in selected places were as follows:

	Metric Tons per Square Kilometre.
Embankment Gardens, London	214·17
Birmingham	255·55
Newcastle-on-Tyne	186·57
York	108·49
Exeter	106·65

This shows that very great waste is going on wherever coal is used in its raw state. Students of fuel economy have long been aware of it; but it has taken this war to force the question to the front. Coal has become scarce and dear, and economy must of necessity now be practised. The impression produced has been so great that even the Government itself has requested the public to use coke instead of coal. In the interests of national economy—something greater than the welfare of even one large industry—it is to be hoped that they will listen to those in authority, and co-operate to prevent a continuance of the waste of those valuable products which, if recovered, would assist in building-up the national wealth. I know there are difficulties in the way. It is not possible to get rid of all open fire grates or to use coke in all factories at once. But a beginning can be made, and the gas undertakings throughout the country should energetically take up the question. Considerable progress is being made in and near London, as all who read our Technical Journals know; and, in passing, I should like to pay a tribute to the London Coke Committee for the persevering and valuable work they are doing in extending the use of coke, and also for the readiness with which they put their experience at the disposal of the whole industry.

TAR.

Turn next to tar. Everyone in the industry before the war knew its great value, and many deplored the lack of enterprise in developing it. The war, however, has brought about a great change. While the market in the immediate past may have been as bad as it has been for many years, yet there are distinct signs of a reaction and growth towards a permanently enhanced position. In the early days of the war it played its part in producing extra supplies of benzol and toluol; and while some development has been going on in the manufacture of dyes, yet it was the great war that compelled the Government to take the matter up, and lend a helping hand in recovering an industry which always should have been ours. The development of the tar product business is an all-important matter to the gas industry, and one in which they should be more intimately connected than in the past. The war has made this a necessity.

SULPHATE OF AMMONIA.

Now consider the position of sulphate of ammonia. For many years previous to the war the Sulphate of Ammonia Committee did very useful propaganda work; but all its efforts did not, and could not, put sulphate into such a prominent place as the war has done. The home product is an absolute necessity now—eagerly sought after by all those interested in, and anxious to increase, the production of food, whereas before the war it was very difficult to get it used. It was only after much patient work in Devonshire, extending over many years, that I at last succeeded in selling about one-third of our annual output at Exeter for the home market. I am sure many others had similar experience. Now, of course, there is not nearly enough produced locally to meet the demand; and the war has swept away much prejudice concerning its use. "Necessity is the mother of invention," and the farmer has found out how to use sulphate now that the foreign nitrate cannot be bought in sufficient quantities. A few years ago not many people ever thought of a British Board of Agriculture openly urging the use of sulphate of ammonia for intensive culture. Yet this has come to pass; and it is the war that has brought it about.

BENZOL.

Let me now turn to benzol. Here, again, the war has brought this product of the gas-works into the greatest prominence; and the supplies that are now being produced will I hope hasten our victory over the enemy.

At Exeter, as long ago as last Midsummer, it was decided to put down an oil-washing plant. Unfortunately, there was considerable delay in the delivery of a large portion of the apparatus; and it was not actually started until Nov. 21 last. There were some minor difficulties in starting; and it was Dec. 1 before it could be put really into regular operation.

A site was available at one corner of the works, close beside a tar-refining plant; and the new benzol plant was erected to face the tar plant, so that one man working between can attend to both. It is covered with a home-made galvanized iron roof supported by steel stanchions. Three cylindrical storage tanks already on the works were utilized. The benzol tank, put underground, has a capacity of 4000 gallons; and the benzolized and de-benzolized tanks, a capacity of 3000 and 3500 gallons respectively. A Livesey washer is used; and a froth of 5 to 6 in. is obtained. The still is a direct-fired one, with a forced draught furnace for burning breeze; and there is the usual benzol still, heat exchanger, condenser, and cooler. The small amount of steam required is supplied from the vertical boiler attached to the tar-refining plant.

The results obtained so far are as follows:

	Coal Carbonized. Tons.	Benzol Produced. Gallons.	Per Ton of Coal Carbonized. Gallons.
December, 1916	3884	2625 of 52 p.ct.	0·68
January, 1917.	4083	6269 of 63 ,,	1·53

About 40 p.ct. of the coal used was Somerset, and the remainder Derbyshire and Yorkshire.

In December, the plant could not be kept working continuously. There was some slight trouble with the purifiers, but more with naphthalene. No naphthalene was deposited on the works; but in the third week in December the deposits in some of the district mains necessitated a stoppage. In January, it was kept going the whole of the month.

The naphthalene experience may be useful. Tests made at the works for the content in the gas showed as follows:

1916.	Grains per 100 C.Ft.	1916.	Grains per 100 C.Ft.
Nov. 15	4·32	Nov. 23	1·03
,, 16	4·37	,, 25	2·80
,, 17	4·03	,, 28	2·87
,, 22	1·07	,, 29	2·93

As the oil-washing was started on Nov. 21, so an immediate reduction in naphthalene resulted. During December the quantity gradually rose until it was necessary to shut down on Dec. 20, but afterwards it quickly decreased. The tests made gave the following results:

1916.	Grains per 100 C.Ft.	1916.	Grains per 100 C.Ft.
Dec. 1	2·16	Dec. 18	6·35
,, 8	5·61	,, 22	4·26
,, 14	8·32	,, 29	1·56

The average naphthalene in the wash-oil used amounted to 12·06 p.ct. by distillation, and this would, of course, be added to by washing. Thinking that this may be the cause of the increase in the naphthalene in the gas, a method of extraction (suggested by the makers of the benzol plant) was tried which does not need large cooling pans. A ¾-in. connection was tapped into the bottom reflux section of the benzol still, and the distillate run off slowly into a tank. The flow from this pipe consists chiefly of naphthalene, which is thus prevented from returning with the wash-oil, and solidifies out on cooling. There is very little wash-oil with it; but what there is is easily returned to the storage tank. Tests were made to ascertain the effect on the wash-oil and the gas. The results were as follows:

1917.	Naphthalene in Gas. Grains per 100 C.F.	Naphthalene in Wash-Oil p.ct. on Distillation.
Jan. 1	1·93	—
,, 4	1·60	—
,, 9	3·50	—
,, 10	—	7·95
,, 13	3·08	—
,, 18	—	7·62
,, 25	2·88	7·31
,, 30	2·91	6·24

It will be noticed that the naphthalene in the gas was low at restarting the benzol plant on Jan. 1; and though it increased during the month, the highest content was less than one-half of the maximum in December. The wash-oil started with an average of 12·06 p.ct. by distillation, and certainly increased in December, although I am sorry I have no actual tests to give. After ten days' extraction by the new method, the naphthalene in the wash-oil fell to 7·95 p.ct. by distillation; and it has been maintained about that quantity, notwithstanding the continual absorption from the gas. This process of extraction has succeeded in preventing the wash-oil being over-saturated with naphthalene, and has enabled a substantial reduction to be made of the content in the gas. During the winter, a vaporizer has been in use; and in January 22 gallons of petroleum per million were mixed with the gas. But still there has been district trouble with only from 2 to 3 grains of naphthalene in the gas.

There is still much research work to be done in connection with the oil-washing process. Difficulties have been met with, and not yet altogether overcome. These difficulties should not, however, lead anyone to put obstacles in the way of an increased production of benzol. It is a national necessity at the moment. A shortage might bring about a calamity, from which the nation might not be able to recover. Just think what a position anyone would be in if darker days came than those through which we have passed, and the cause was apathy and indifference on the part of those who could, but did not, give abundant supplies of an absolutely essential article in winning the war. But I do not think this is likely to happen. The request for more and more benzol has been made; facilities are provided for its production in the Calorific Standard Act; and I believe we shall now all do our utmost for the country we all love so well.

THE RESIDUAL OPPORTUNITY.

I have wandered into detail which I hope may be of some interest; but let me now bring your thoughts back to my main point, which is the great prominence given during the war to what we call the residual products of the gas-works. It is due to the sudden discovery of alarming deficiencies in articles absolutely necessary to the proper equipment of our fighting forces, and to the compulsory overhauling of all our industrial and domestic habits with a view of effecting economies to provide, in some measure, for the enormous war expenditure. This process has shown how much more valuable these residual products are than has been hitherto realized; and the gas industry will be doing a national service if full advantage is taken of the opportunity now presented of developing their popularity and extending their use. In so doing, some financial benefit may result; but we must remember that gas undertakings were controlled establishments long before the war, and will remain so afterwards. Under this system of control, the greater portion of any extra profit earned goes into the pockets of the consumers of gas in the shape of reductions in price.

THE CALL FOR EFFICIENCY.

I have already dealt with the question of fuel economy and also the development of residual products; and I now come to another point which covers both and much more. It is the almost universal demand for an increased efficiency in every department of our national life. In the past we have been perhaps too prosperous; and it has caused us to take things too easily and to avoid testing and proving our work. Now, when the great trial has come, much of it has been found unsound; and many deficiencies have been revealed. We have been content to acquire wealth by merely buying and selling, instead of producing and selling. The result has been that other nations have been rapidly gaining on us, and reducing the lead we have long possessed in the world's commerce. I think we have learnt our lesson. An appeal to develop our home industries has often been made in the past; but the policy has come in earnest now, and commands universal approval. The new order of things will beneficially affect the gas industry, like all others. It will need receptive and sympathetic minds to watch the change, and to note and take advantage of the opportunities of co-operating with the new national movement. I have already indicated some of the directions in which co-operation can be given. But this is not all. In every department, new energy can be introduced. All the help that scientific research can give should be utilized; and then, perhaps—notwithstanding the troubles and trials we have experienced and may yet have to face—we shall be still able to broaden and strengthen our business.

I do not wish to convey the impression that the gas industry has been lacking in enterprise in the past. It has not. During recent years a great advance has been made in every department. I only want to emphasize the necessity of further and renewed efforts to help the cause of national recuperation and reconstruction which must be faced when peace once more reigns supreme.

NATIONAL GAS COUNCIL.

This new efficiency that is needed must be national as well as individual. The industry must co-ordinate and focus its energy; and an instrument is needed for the purpose. The war has compelled us to provide it. There have been some hesitation and doubt; and perhaps part of it is quite justified. But a divided lead is disastrous in normal times, and it is fatal in a crisis. So we now have our National Gas Council embracing the four sections—engineering, commercial, legal, and manufacturing. The members of that Council are devoting their time and energy to those questions in which it is necessary that we should speak with a united voice; and we are grateful to them for it. It only remains for all to see that they get the requisite support to carry on.

THE BRITISH COMMERCIAL GAS ASSOCIATION.

I should just like to refer to the activities of one of the constituent bodies of the National Gas Council. The British Commercial Gas Association has long justified its existence. It has beneficially affected the commercial side of the whole industry, by, among other things, bringing the companies and corporations together into one Association, and providing a channel for co-operative effort—thereby achieving many a good object collectively, which individually would be impossible. For the future, it gives us an organization through which many a sales problem may be solved; and I hope the time is not far distant when all gas undertakings will be numbered among its members.

CONCLUSION.

It is time to conclude. In what I have said I have endeavoured to indicate some of the important things which should at the present time receive close attention. I have suggested directions in which the position of the industry can be improved. I have visions of a greater future for it. With increased efficiency in the retort-house as well as in all parts of the manufacturing plant, with a better developed market for residuals, I hope to see cheaper gas when the present trouble is past and gone. It may look scarcely possible, if present market conditions only are taken into consideration. We must, however, try to distinguish between what is transient only and what is permanent. Present prices of raw materials will probably fall considerably after the war. With cheaper gas will come larger consumption. Larger consumption will mean less waste of coal, purer air in our large cities, and a conservation of wealth which will be the gas industry's contribution towards easing the great burden of debt brought about by the war. It is an ideal which is worth thinking about and working for, and I commend it to your consideration.

Mr. JAMES PATERSON (Cheltenham) proposed a hearty vote of thanks to the President for his helpful and instructive address. He thought that those of the members who had passed through the presidential

chair realized—he certainly did himself—the effort that was required to frame an address suitable for laying before the Association; and the address that the President had given them that day was entitled to their hearty appreciation. Day by day they were all engaged in work which grew heavier as time went on. Gladly they did it. They knew the work they were now doing was of national importance. But amid it all their President had found time to utilize his ability to frame an address which, he (Mr. Paterson) believed, would stimulate and carry them forward into the coming year towards the objects to which they were moving. He might also say that the parts of the address where the President gave the figures as to his working results were a complete answer to certain professional prognostications, so far as they could be formulated. [Laughter.] He read that these comments and criticisms were looked at askance; but they would like comments of the kind formulated. If there were improvements to be made in the industry, let them know precisely where and how. He thought the President's address showed at any rate that the industry was doing the best it possibly could at the present time.

Mr. F. W. Cross (Lea Bridge), in seconding, said the members were much indebted to the President for the work he had put into the address, and at a time when they were all busy with war work. There was one point he should like to ask Mr. Westlake in reference to his oil-washing plant, and that was the position in which he placed the washer. This might have some bearing on the naphthalene question.

The motion was carried by acclamation.

The President, in reply, said he was very conscious of the defects of the address. But it was prepared under difficult circumstances, when the only recreation was the distractive one of watching the gas-holder sheets sinking. [Laughter.] This did not help him to prepare the address. But he was grateful for the opportunity of contributing to the "Transactions" of the Association; and he hoped it would not be unworthy of being placed among the many that had preceded it. In answer to Mr. Cross, the Livesey washer was immediately before the purifiers—some 50 yards from them.

The May Meeting.

The President then made an announcement with regard to the May meeting. The Committee, he said, had had the subject under consideration; and the date was fixed for Thursday, May 17. He was desired by his Chairman and Directors to give the Association a most cordial invitation to visit Exeter. They, as well as himself, would be delighted to see the members down there, if they could see their way to go. He knew there were difficulties. The times were not normal. But it had been the custom for the Association to visit the works of the President in his year of office; and, if it were possible, he should not like the tradition to be broken, though, if the times were too difficult, he would be quite willing to fall in with the wishes of the members. If they could visit Exeter, it would be something more than a compliment to his Chairman and Directors and himself. It would be a compliment to the members of the Association in the West. For some years now, efforts had been made to enlarge the membership, and to get engineers in that part of the area to take more interest in the Association. To an extent, there had been success. There were more they would like to get in; and a visit to Exeter might help this object forward. He would promise they would give the members a hearty Devonshire welcome. So far as he could see, the London members would have to go down the night before, unless they left by the 7.30 train in the morning, which arrived at Exeter at 12.25.

Mr. W. B. Farquhar (Ilford) moved that the members accept, with hearty thanks, the invitation the President had given them. Not only from the point of view of the historical associations of Exeter, but on account of what the President had to show them at his works, they ought to try to make the meeting a great success.

Mr. H. Buckley (Windsor), in seconding, remarked that their President had taken great interest in the work of the Commercial Sections.

The motion was cordially passed.

The President thanked the members, and said he should have pleasure in intimating to his Chairman and Directors the acceptance of their invitation.

Recruiting and National Service.

Mr. W. E. Price (one of the Joint Hon. Secretaries of the National Gas Council) made, in private sitting, a communication to the members on the above subjects, which was supplemented in one or two particulars by Mr. F. W. Goodenough, Mr. Price's fellow Joint Hon. Secretary of the National Gas Council.

The members subsequently had tea together.

New England Association of Gas Engineers.

The "Proceedings" of the New England Association of Gas Engineers at the 45th and 46th meetings, held at Boston (Mass.) in 1915 and 1916, have been bound up together, and form a substantial volume, a copy of which has been forwarded to us by the Secretary (Mr. N. W. Gifford). In addition to portraits of the Presidents for the different years (Mr. C. A. Learned, of Meriden, and Mr. H. K. Morrison, of Lynn), there are many illustrations accompanying the thirteen papers, the reading and discussing of which comprised the technical portion of the proceedings. Glancing at the Table of Contents, in which the name of each paper is given, followed by a list of the speakers who contributed to the discussion of it, one sees the good debating power of the Association, even when taking into consideration the fact that the subjects dealt with on the occasions referred to were of general interest to the members. There were thirteen speakers on a paper relating to the "Burning and Distilling of Water-Gas Tar," fourteen on another dealing with a "New Coal-Gas Installation at Fall River," and twenty on the subject of "Free Burner Maintenance." It should, of course, be mentioned in connection with this remark that the Association is one of considerable size—the roll of honorary, active, and associate members, on Jan. 1, 1916, totalling 259.

THE RECTIFICATION OF BENZOL.

At a Meeting of the Midland Institute of Mining, Civil, and Mechanical Engineers, held at Doncaster last Thursday, a paper on the "Rectification of Benzol" was submitted for discussion by Mr. W. Newton Drew, of the Rockingham Chemical Works. The Institute is representative of over thirty collieries; but through lack of time following a debate on a mining engineering contribution, or through the absence of those more interested in coke-ovens and recovery work, no discussion took place. Mr. Newton Drew's paper constituted, however, an excellent description of the plant and working involved in benzol rectification, and is therefore of interest to those "Journal" readers who are engaged in, or may be ultimately contemplating, rectification of the crude benzol now being recovered on gas-works.

Mr. Newton Drew stated that, although the adoption of the bye-product coke-oven has changed details of absorption with oil and distillation of the crude benzol, the methods of washing the crude benzol and distilling the same for rectified products are very much the same as formerly. Nearly all bye-product oven installations nowadays recover their benzol, toluol, &c., in the form of 65 p.ct. crude benzol—that is, benzol which when distilled in the laboratory will give 65 p.ct. as a distillate under 120° C. In former days this crude benzol was transferred at once to the washer, and thence to the rectifying still, whence 90 p.ct. benzol, 50/90s. benzol, toluol, and naphtha were produced. The modern practice is, however, to distil this unwashed crude benzol in a still of simple construction, and to separate an unwashed benzol fraction, an unwashed toluol fraction, and an unwashed naphtha fraction; the residue being run into a pan where the naphthalene solidifies out on cooling. The benzol fraction will be the first distillate up to the point at which the product at the delivery gives its first drop at about 105° C.; and the toluol fraction the second distillate up to the point at which the delivery product gives its first drop at about 124° C. These three partly-rectified unwashed fractions are accumulated in separate tanks, and are in due course blown or pumped separately to the washer, where the material is agitated with acid and then with caustic soda.

A patent has recently been taken out by Messrs. Simon-Carvés and Moss, whereby the whole routine of the washer is obviated. In the new process the vapours from the crude-benzol still before condensation are conducted first through acid and then through caustic soda. This system, if successful, would be an immense gain; but the author has no knowledge as to whether it has proved commercially satisfactory. Mr. M. Wynter Blyth has devised a method for the continuous washing of crude benzol, whereby the liquid falls down a series of long vertical tubes, and is treated in succession with the right proportions of acid, water, alkali, and water, and is continuously delivered in a washed condition.

By washing, the crude material is freed from thiophene, pyridine, and various other impurities, and loses from 8 to 12 p.ct. of its volume. It has now become washed crude benzol, toluol, or naphtha, light brown in colour, and is ready for rectification. The stills for treating the unwashed crude and the washed crude are usually similar, except that the latter have a more elaborate fractionating apparatus, whereby the compounds of different boiling-points are more completely separated at the cost of more time and more steam.

Mr. Newton Drew, after describing the process of rectification, said he commended the running of a benzol still as being both interesting and instructive. Speaking roughly, a charge of (say) 4000 gallons of washed crude benzol contains 0·25 p.ct. of carbon bisulphide, boiling at 58° C.; 82·75 p.ct. of benzene, boiling at 81° C.; and 17 p.ct. of toluene, boiling at 111° C. The washed crude benzol fraction will test 86 p.ct. at 100°, the washed crude toluol fraction 95 p.ct. at 120°, and the washed crude naphtha fraction 70 p.ct. at 160° C. A sample should always be tested by the standard War Office method before the bulk is distilled. If a charge of this washed crude benzol be taken, and steam introduced into the coils of the still, the liquid will boil, and the vapour rising at first will consist of some carbon bisulphide, much benzene, and a trace of toluene. The toluene and some of the benzene are condensed in the fractionating column and continuously return to the still, scrubbing out of the vapours which may rise through them any mechanically carried particles of liquid. The vapour which leaves the top of the fractionating column is therefore benzene rich in carbon bisulphide. In the dephlegmator this vapour is cooled to such a point that the benzene in it is partly condensed and passes back as liquid to the base of the column. The vapour travels on, is liquefied in the condenser, and should be rich in carbon bisulphide and other low boiling impurities. This distillate, which amounts to 3 p.ct. of the charge, is usually run into a separate receiver. After a time the temperature at the top of the fractionating column will rise, and benzene becomes the sole compound delivered in the separator. The product is then turned into a fresh receiver for 90 p.ct. benzol; and distillation continues with little change for a considerable time. Ninety per cent. benzol is, however, in these war times, superseded by standard benzol—that is, benzol giving 95 p.ct. below 90° C.; and for this the still is not run so far. Ninety per cent. benzol contains approximately 84 p.ct. of benzene, 15 p.ct. of toluene, and 1 p.ct. of xylene. Standard benzol contains about 96 p.ct. of benzene and 4 p.ct. of toluene.

In running a still for standard benzol, the operator must be guided largely by his laboratory test with a sample of the charge, which will show him what quantity of final products he ought to

obtain. After changing the still from making "standard benzol," it is usual to make an "intermediate" benzol-toluol fraction, and then to run for 90 p.ct. toluol; or the distillation may be stopped and the charge "topped-up" with the washed "once-run" toluol fraction. Ninety per cent. toluol is not so easy to make as standard benzol. No one rectifying plant employs the same system as another of collecting intermediates and residues from distillations, nor of "cutting" fractions during distillation. But the final products are usually standard benzol, 90 p.ct. toluol, and solvent naphtha; and these products should be obtained with as little redistillation as possible.

In the distillation of both washed crude benzol and unwashed crude benzol, "topping-up" is frequently made use of—that is, after the benzol fraction has come off completely, the distillation is stopped and the residue allowed to cool down somewhat in the still. Then a fresh supply of crude unwashed benzol is added, and the still run for benzol as before. This "topping-up" is repeated until the still is nearly full of residue; and the still is then run for the toluol and naphtha fractions. This method is the easiest way of ensuring that the still shall work on as full charges as may be possible, and consequently with the minimum of starting, stopping, and changing over.

The accompanying table embodies records taken in the rectification of a charge of washed crude benzol. In this case, there was no preliminary fractionation before washing; and the distillation is a continuous one through the whole series, and therefore very instructive. Observations were taken every two hours during the 52 hours of the operation. The charge was 4640 gallons, and the production was as follows:

Product.	Quantity.	Carbon Bisulphide (CS_2) and other Impurities	Analysis.			Remarks.
			Benzene.	Toluene.	Xylenes.	
	Gallons.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
First runnings .	208	1·8	97·0	1·2	—	By Govt. test. First drop, 80° C.; 97 p.ct. at 90° C.
Standard benzol.	2331	—	95·0	5·0	—	
Intermediate .	212	—	56·0	54·0	—	
Commercial toluol	638	—	8·0	76·0	16·0	By Gov. test.
Solvent naphtha.	449	—	11·0	89·0	—	By retort test. First drop, 123° C.; 90 p.ct. at 160° C.
Creosote . . .	755	—	—	—	—	
Loss	47	—	—	—	—	

This distillation was made early in the year 1915. Not more than 5 p.ct. of toluol is now permissible in solvent naphtha; and the author's firm [Messrs. Newton, Chambers, & Co., Ltd.] now make it with the first drop at 133° C.

Mr. J. A. Wilson, of Staveley, recently stated at a meeting of the Coke-Oven Managers' Association that 70 to 72 p.ct. of the crude benzol treated should be recovered as rectified products.

It is important that the pressure of the steam should be constant—preferably not less than 75 lbs. The more elaborate the fractionating apparatus is, the more steam will be required, and naturally, also, the toluol and naphtha will require more steam than the benzol. The author has been recently informed that in rectification about 28 lbs. of steam are required per gallon of unwashed crude benzol. This figure includes pumping, &c.

All pipes used in conveying benzol should be properly earthed. There seems no doubt that an electric potential is created by the rapid passage of benzol through a narrow pipe.

Mr. Newton Drew concluded with a few remarks on the future of the benzol market. At present every gallon of the explosive bases, benzol and toluol, is required for the Allied cause; but after the war, allowing for a certain quantity of these products used for dyes, some 40,000,000 gallons of benzol per annum will have to be sold as a motor spirit. This benzol must be of standard quality as regards the distillation test, purity, and dryness. It must be obtainable in standard 2 gallon tins at a standard price. He, however, states that nothing has been done by the producers as a body to prepare for this market; and he suggests that if the war were to suddenly stop, the industry (including gas undertakings) would have no organization whatever and would be "at the mercy of the highly organized petrol combinations which have hitherto succeeded in selling an inferior fuel at a higher price." Mr. Newton Drew thinks that the recently-formed Association of British Chemical Manufacturers should be made representative of the bye-product industry; but he inclines to the opinion that a local Association for the bye-products of the Midland Counties would be of more immediate service—presumably so far as the district covered is concerned.

The Secretary of the Midland Institute (Mr. Blake Walker) supplemented these remarks by drawing attention to a recent speech of the Chairman of the Bradford Dyers Association, as to the necessity of securing after the war an ample supply of benzol for the dyeing industry at a price which will help in the competition with German goods; and also to the possibility of this supply being affected by petrol combinations buying up the whole of the country's benzol, in order to control the petrol market.

SCOTTISH JUNIOR GAS ASSOCIATIONS.

Joint Visit to Falkirk.

On Saturday afternoon the Eastern and Western Districts of the Scottish Junior Gas Associations had a joint outing at Falkirk. There was an excellent turn-out, all circumstances considered, the party consisting of about forty.

The first item of the visit was a tour of inspection of the Falkirk Gas-Works, where the visitors were shown round by Mr. W. Wilson (the Manager), Mr. John Wilson (the Assistant Manager at Greenock, and formerly of Falkirk), Mr. Kenneth Mackay, Mr. Lennox, Mr. Frew, and Mr. Hope. The two chief objects of interest were the toluene extracting plant and the silica segmental retorts. About a year ago the Falkirk works had a silica retort fitted up for experimental purposes, and the success was such as to warrant the installation of three retorts, the working of which gives the fullest satisfaction. These retorts are bottom ones, as they have to stand the greatest heat there. It is intended to instal more, if convenient. The retorts are segmental, because it was found that, owing to the great expansion of silica under heat, they were apt to crack in the kiln if they were all in one piece. For example, the makers were only able to get six perfect specimens out of twenty-four placed in the kiln. The cracking danger is now obviated by placing sheets of cardboard between each segment while the retort is being built up. Then, when heat is applied, the cardboard burns away, and gives the silica segments room to expand.

The experimental silica segmental retort installed in Falkirk close on a year ago, was the first in Scotland. Portions of the retort, shown on Saturday, were practically none the worse for wear, after ten months' service.

The present toluene plant in use at the works was patented by Mr. W. Wilson in January, 1916, following the installation of experimental plant in June, 1915; and it has worked continuously with entire satisfaction since it was installed. It consists of underground wash-oil storage tank, oil pump, scrubber feed-regulating cistern on the scrubber top, benzolized oil receiving cistern, still, heat exchanger, oil cooler, spirit condenser, spirit receiver, and underground tank. The crude spirit contains 55 p.ct. benzene and 17 p.ct. toluene, besides a considerable quantity of naphthalene. Naphthalene troubles in service-pipes in the district—formerly very prevalent—have disappeared since the introduction of this plant. The quantity of crude oil passed through the scrubber is approximately 40 gallons per ton of coal carbonized; and the spirit extracted is 2 gallons per ton of coal. The crude spirit is sold in tank wagons. Mr. Wilson represents the Ministry of Munitions in the eastern district of Scotland; and it is a compliment to his inventive ability that his toluene extracting plant has been installed in several other places.

Included among the party were several representatives of the Falkirk Corporation; and following the visit to the works, the members were entertained at tea by the Town Council in Mathieson's Tea Rooms. Dean of Guild Muirhead (the Convener of the Gas-Works Committee of the Falkirk Town Council) presided, and extended to the visitors a hearty welcome on behalf of the Corporation. Mr. J. J. Scott (Largo), the President of the Eastern District, and Mr. David Fulton (of Helensburgh), an ex-President of the Western District—representing Mr. G. T. Purves, of Auchengeich, the President—returned thanks on behalf of their respective districts.

The Use of Gas for Artificial Drying.

In the course of a paper presented at the annual meeting of the American Society of Heating and Ventilating Engineers, held in New York, Mr. G. C. Shadwell remarked that but little is known on the subject of artificial drying, which some associated with heat, and others with movement of air. The majority of drying problems are best served by passing a stream of properly heated air continuously through the apartment; the air being kept in motion, and the relative humidity low. He pointed out that 70 c.ft. of town gas could be so applied as to raise 20,000 c.ft. of air at 70° to 170°, or 10,000 c.ft. to 270°. The air at 170° would carry away more than 25 lbs. of water; while at 270°—a temperature above boiling-point—the drying effect is only limited by the latent heat of evaporation. If fully saturated air at 70° is only raised to the extent of 10°, the humidity is reduced to less than 50 p.ct.; and if raised to 170°, it is practically dry. Nothing will absorb water more efficiently than warm dry air in motion; and the efficient heating of air for this purpose has occupied much attention for many years. He described a gas-heated apparatus, built on the lines of a vertical tube boiler, intended to be used in conjunction with a suitable type of blower. The body is insulated by a layer of porous asbestos, protected by an outside sheet-steel casing. The hot flue gases pass upwards through the vertical tubes, and the cold air is admitted tangentially at the top of the cylinder, circulates round the exterior of the tubes, and finally strikes a baffle that directs it against the hot flame plate before reaching the outlet. The contrary flow of air, together with the extensive heating surface, makes for the highest maximum efficiency. The form and nature of the substance being dried frequently governs both the temperature and flow of air, and the gas-burner admits of delicate adjustment according to requirements.

THE COMPOSITION OF POWER GASES.

Mr. Tookey before the Society of Chemical Industry.

At the Meeting of the London Section of the Society of Chemical Industry on Monday last week, Mr. W. A. Tookey read a paper on the composition of power gases. He pointed out that in the history of the development of the gas-engine, mixtures of very different compositions have been used from time to time; and it must be generally admitted that, notwithstanding all preconceived ideas based upon more or less intelligent anticipation, progress had been achieved quite irrespective of the composition of the gas forming the combustible mixture.

The proper method of utilizing power gases, so greatly varying in density, in chemical composition, in calorific value, and in the amount of air required for theoretically complete combustion, had been a matter, the author pointed out, which only painstaking and persevering experiment by the practical system of trial and error had discovered. Scientific research, valuable though it had been, had not to any great extent aided the experimental staffs in gas and oil engine manufacturing establishments, although in making this statement he wished it to be understood that he had not overlooked the excellent work carried but by such men as Mr. Dugald Clerk, D.Sc., also by Messrs. Burstal and Alexander and by Dr. Bertram Hopkinson. Nevertheless, and notwithstanding the work done by the Gaseous Explosions Committee of the British Association, so far as the author was aware there had been no definite lead given by any man of science to indicate what might be deemed to be the goal to aim at if it were required to manufacture a gas for power purposes without reference to prevailing circumstances in the gas-making industry or any commercial interest.

Referring to the tests which he carried out in 1900 for the Gas Light and Coke Company, Mr. Tookey briefly explained the Tookey factor, which he then arrived at for comparing engines of various sizes, different systems of construction, and in all stages of repair and disrepair. By means of it he was able to properly estimate their respective performances. The matter was dealt with in a paper before the Institution of Mechanical Engineers in January, 1914 ["Journal," Vol. CXXV., p. 158]. The basis of comparison took into account the ratio of total cylinder volume to the clearance volume or pressure to which the charge of gas and air is compressed before ignition. The author has since evaluated this Tookey factor for various compression pressures.

Test results of eight engines of greatly varying characteristics as regards construction, compression pressures, &c., showed that, generally speaking, the output-consumption curves indicated no divergencies due to the nature of the working mixture. Town gas mixtures as in the case of a Browett-Lindley engine, or liquid fuel mixtures as in the case of a Willans-Diesel engine, are practically identical. A comparison of the test results recorded in the standard works on internal combustion engines, when recalculated upon the author's mixture strength basis, proved that the richness of the full-load mixtures used have been strikingly uniform and of the order of 45 B.Th.U. per cubic foot, based upon the total cylinder volume. It was a striking fact that the actual thermal efficiencies attained had been in strict agreement with calculations based upon uniform mixture strength—a fact brought out in the Institution of Mechanical Engineers paper referred to above.

Since the outbreak of the war the author has had an opportunity of testing the same engine upon stripped and unstripped gas, and has found that, under the same load and conditions, there was a falling off in the power developed per impulse on the stripped gas, and therefore an increase in gas consumption, of from 10 to 13 p.ct. The indicator diagrams showed that while the unstripped gas gave a regular series of impulses as regards power, the consecutive explosions of stripped gas mixtures were most irregular under certain conditions. But regularity of ignition was at once restored when the mixture strength was increased, by proper adjustment, to that of the stripped gas, and this by merely turning the gas regulator open a little more. This again confirmed the statement that the composition of the gas matters little, but that the strength of richness of the working mixture matters much.

It was important, however, that there should be constancy as regards calorific value; for if this should vary but slightly the working of the engine is affected. This was a disadvantage in connection with suction producer gas, because at present it was not possible to adjust the rate of air admission to compensate for the irregularities in calorific value. As an internal combustion engineer, therefore, the author would say to engineers and chemists of gas undertakings, that to a certain extent it is immaterial what kind of gas is made for the purpose of serving gas-engines; but, whatever its composition, every effort should be made to obtain uniformity—remembering particularly that the less rich the gas in calorific value the more important is it that constancy of product should be striven for. Similarly with pressure. Whatever the pressure of supply might be, it mattered very little so long as it remained uniform. This was obvious, seeing that gas-engines were daily started-up on a rich gas under pressure, and switched-over to a power gas under suction. All the same, gas engineers frequently asked whether there should be a limiting minimum supply pressure to engines; and, if so, what. The minimum pressure on a town-gas service-pipe must always be sufficient to keep the gas-bag diaphragm well inflated between charges taken by the engine when working under full load. Those gas companies who had, or who were about to inaugurate, a gas-engine maintenance scheme would be well advised to include as part of the instruction to employees to renew the india-rubber gas-bag diaphragms when flabby and irresponsive, and to periodically cleanse the anti-pulsating valve attached to the diaphragm, so as to ensure its smooth and reliable operation. Quite a large proportion of the complaints of "bad gas," or "lack of pressure," would in this way be avoided.

Uniformity of calorific value was more difficult to control, having regard to practical gas-making problems and variation in fuels. That very considerable success was obtained, however, was born out by the figures reported by the Metropolitan Gas Referees, and no doubt it was the same in other large cities, although in many provincial towns no analysis could be obtained nor any statement as to calorific value given, because the proprietors would not sanction the expense of purchasing the necessary and simple apparatus required, even if among the staff a man could be found able to take daily records.

Dealing with pre-ignition in gas-engines, Mr. Tookey expressed the opinion that the complaints so often heard, that this is due to too much hydrogen or methane in the gas, are not supported either by tests or experience. His opinion is that it is a matter of mixture, and that pre-ignition can be obviated by weakening the mixture. If this were not so, it was impossible to account for the fact that natural gas with its 92 p.ct. of methane could be used in America in gas-engines, while coke-oven gas with its 50 p.ct. of hydrogen and 36 p.ct. of methane was also used satisfactorily when a certain proportion of the charge consisted of exhaust gas. The function of the latter was to weaken the mixture.

In conclusion, the author said that the point of the paper was that, while giving no preference to any of the power gases for engine work from the point of view of their relative composition, purity, pressure, and uniformity of composition and pressure of supply were of far more importance from the engineer's point of view than the calorific value.

Discussion.

Prof. H. E. Armstrong, F.R.S., who opened the discussion, thought it would come as rather a surprise to a good many (and Mr. Tookey seemed to have made out a very clear case) that the main conclusion of the paper should be that not only as regards gases but as regards even sprays and vapours, their composition was not the determining factor. This would come as a welcome piece of information to users of internal combustion engines generally, and would make them realize—and that, after all, was the important thing—that it rests with them, by proper adjustment, to get the maximum efficiency from the fuel they were using. He would like to know to what extent the author thought it desirable, in the public interest, to go on reducing the calorific value. From the diagrams it was difficult to gather whether the author stopped at 300 B.Th.U., or whether he intended to go considerably below this figure, which was an important matter in connection with the supply of low efficiency gases such as Mond gas. It was satisfactory to have the hydrogen bogey disposed of, because this had been one of the difficulties before users.

Mr. G. Nevill Huntly referring to the author's conclusion that, so long as the calorific value of the gas was kept constant, nothing else mattered, said that this would apply if one was purchasing British thermal units; but it mattered a great deal when one was purchasing volume, as was the case with the ordinary consumer of gas. The density of the gas must also have some effect, directly or indirectly; and whether or not it was kept constant must affect the quality of the gas.

Mr. W. J. A. Butterfield, speaking with regard to pre-ignition, said that those engineers who had investigated the matter had not given the attention they might have done to the minor constituents of the gas and their influence upon pre-ignition. For instance, was a gas containing an appreciable proportion of carbon bisulphide more liable to pre-ignition than one free from it? In the small proportions in which this constituent occurred in town gas, it was unlikely it would cause any difference; but it would be interesting to hear whether in Mr. Tookey's wide range of investigations in North and South London he had observed if pre-ignition was more prevalent where the carbon bisulphide was not removed from the gas than where it was. Again, with producer gas, the minor constituents were scarcely ever looked for; but he (Mr. Butterfield) wondered, from the fact that the author had found that sulphur projected into the cylinder had caused pre-ignition, whether the carbon bisulphide might not have the same effect if present in small proportions. Another point that had been neglected in investigations upon gas-engines was the study of acetylene. This was a gas of high calorific power and comparatively low temperature of ignition; and it would be interesting to see if the efficiency with such a gas came out in the region of that of the other gases, oil, &c.

Mr. P. H. Joselin, referring to Mr. Tookey's statement that a stripped gas gave 10 to 13 p.ct. less efficiency than an un-

stripped gas, said he had never found the difference to exceed 7 p.ct. The illuminating value, of course, went down to a negligible quantity.

Prof. J. S. S. BRAME said that the point as to the similar behaviour of gas-engines with very different classes of fuel, was a most important one indeed. The author's diagrams rather showed that the suction gas-engine did not compare favourably with other forms. But allowance must be made for the difference introduced through having to cut-off the load for the purpose of cleaning out the producer; and any possibility of misunderstanding should not arise when considering the suction gas-engine running under normal conditions. He was very interested in pre-ignition; and four or five years ago he put forward some figures in which he calculated, as the author had done, that the hydrogen content did not matter very much in the case of gases where there was liability to pre-ignition. At the same time he hinted, as Mr. Butterfield had done, that pre-ignition might be due to the minor constituents. The suggestion that carbon bisulphide might cause pre-ignition was well worth following up.

Dr. R. LESSING said the author's curves, showing that there was remarkably little difference in the results obtained with different gas mixtures, came to this, that the amount of combustible matter in the mixtures was comparatively small, and the calorific value of the mixtures per cubic foot of cylinder space was made uniform by the different air requirements of each fuel. Thereby a rich fuel, such as town gas, had to be diluted down to practically the same calorific strength as a mixture made with poor producer gas. As the actual amount of combustible matter in these mixtures was comparatively small, it was obvious that their chemical characteristics could not be very evident, and did not show up in the author's results. However, he (Dr. Lessing) could not help feeling that the composition of the fuel gases and the chemical constitution of their components must influence the working of the engine. Although the output of horse-power might be the same with different mixtures, there must be differences in other respects—such as ignition temperature and propagation of explosion—with bodies of such varying constitution as benzene, methane, carbon monoxide, and hydrogen. He would, therefore, urge them not to disregard the composition of the combustible mixture supplied to the engine, although he recognized the importance and convenience of studying the working of the engine from the point of view of B.Th.U. per total cylinder charge. How necessary it was to consider the quantitatively less important constituents of complex gas mixtures was shown by Mr. Tookey's reference to the adjustment required after changing-over from unstripped coal gas to a gas from which part of the benzol had been extracted, although the difference between these two gases probably amounted to less than 1 p.ct. by volume. There was a danger that the author's statement, that well-made working mixtures with any kind of fuel gave approximately equal results, might be erroneously applied to the fuel gases themselves. It would be as well to make it clear that such a misconstruction was not permissible. The choice between various types of gaseous or vaporous fuels must, in the first instance, depend on the cost per thermal unit, but was also largely influenced by questions of convenience, continuity of supply, capital outlay for the plant, and geographical position.

Mr. A. LING (Chairman of the Section) thought Mr. Butterfield had hit the nail on the head when he suggested that pre-ignition might be due to some such compound as carbon bisulphide. This was an endothermic compound; and under certain conditions it exploded. It would certainly be well worth while for Mr. Tookey to look into the minor constituents of the gaseous mixture.

Mr. TOOKEY, replying first of all to the question raised as to the effect of carbon bisulphide, said his first impression, without having gone into the point at all deeply, was that it did not matter a scrap. He believed it was entirely a matter of mixture strength; and with the gas diluted to the extent that was necessary, the percentage of carbon bisulphide would be extremely small. Therefore, he very much doubted whether there was anything in the point.

Mr. BUTTERFIELD said his point was that the carbon bisulphide, owing to its extremely low temperature of ignition, might act as a "cap" to explode the mixture before it otherwise would.

Prof. ARMSTRONG asked whether there was any advantage in stopping the calorific value at 300 B.Th.U., as seemed to be suggested by the author's curves.

Mr. TOOKEY said he would be inclined to put the limit at 400 B.Th.U. At present, there was no gas so low; "but we were coming down to it."

Dr. SELIGMANN said he had rather understood from the paper that it did not matter what the calorific value of the gas was, but now Mr. Tookey had said that we should not go below 400 B.Th.U.

Mr. TOOKEY said that in putting the limit at 400 B.Th.U. he had in mind the class of gas it would pay public gas authorities to distribute through their mains. The figure did not apply to producer gas or Mond gas.

Dr. SELIGMANN: And that gas can be used with equal efficiency in gas-engines.

Mr. TOOKEY said that was so. Continuing his reply, he said he did not think the density of gases was a matter of practical importance, for the reason that it was quite easy to start-up with a rich town gas and switch-over to producer gas. In one case, the density was 0·4, and in the other 0·8; and yet the engines worked equally well. The difference in the efficiency of stripped and unstripped gas, of 10 to 13 p.ct., was when the stripped gas was used without the adjustment that he had mentioned. When this was done, the difference was reduced to about 5 p.ct. He did not wish it to be understood that suction gas was not reliable, because in many out-of-the-way parts of the world it was the only thing to be had, and it was giving every satisfaction. He agreed with Prof. Brame that, when running continuously, suction-gas plants were as good as town gas. But there was more trouble in adjusting the air to keep the mixture right; and this entailed greater attention.

MACLAURIN'S LOW-TEMPERATURE CARBONIZATION PROCESS.

At the Meeting of the Glasgow Section of the Society of Chemical Industry on Feb. 27, Mr. ROBERT MACLAURIN, of the Glagow Corporation Power Works, read a paper on "Low-Temperature Carbonization and Some Products." Pending the publication of the full text of the paper in the Society's "Journal," we are indebted to the "Chemical Trade Journal" for the following abstract of the communication.

It began with a description of the city's experimental plant, which consists of an elongated producer, about 30 ft. high, in which means are provided to trap the oil condensing in the cold fuel, and prevent it trickling down into hotter regions. This avoids loss of oil; it also prevents the coke binding-up in the upper part of the producer. Power gas, oil, and ammonia are all obtained satisfactorily when burning the coal to ash. The power gas is uniform in quality, and free from stringy tar.

The attempts to make illuminating gas are more interesting. The smokeless fuel manufacture has proved more simple than anticipated. The fuel is hard, easily handled, and burns freely without any smoke. The volatile matter is as low as in gas-works' coke; but the coke ignites readily because the carbon is not graphitic. The attempts to make illuminating gas by a truly low-temperature process have failed completely. From one ton of coal only about one-sixth of the quantity of light olefines, and one-half of the quantity of marsh gas have been obtained, compared with the quantities yielded by either high or low temperature distillation. The oil is also very deficient in light portions; and this, coupled with the absence of volatile matter in the coke, indicates that the decomposition of the coal constituents has not taken place to any extent. The character of the oil bears this out—the oils being quite different from any previously handled on a large scale.

Describing his method of separating the oil into portions, the author said that one portion makes an excellent lubricating oil; and comparative tests of this for friction, durability, and gumming were given. The next portion of the oil is the acid portion. Apparently carbolic acid is absent, and very little cresylic is present—contrary to all past experience. A third portion consists of resinous material, very black in colour; but with benzols, this makes a flexible black varnish. Unlike previous coal-tar products, wood coated with it can be varnished or painted over. In endeavouring to extract the colour from the resin, several peculiarities were discovered. A considerable portion dissolves in water or washing soda with a strong red colour. The ammonia liquor is also saturated with the same material, which when neutral is a pure purple. Apparently these are polyhydric phenols. The purple solution dyes unmordanted wool a purple grey; and the red solution dyes chrome mordanted wool a chocolate brown. By the action of weak acid and oxidizing agents practically all the rest of the tar can be converted into yellow dyes. Calculation shows that 1000 to 1500 lbs. of wool could be dyed from each ton of coal. The dyes are faster than methyl violet, and the worst are equal to patent blue.

The author then entered into advanced arguments from chemical data to show why benzene, naphthalene, and anthracene should not be considered as condensation products of acetylene. Each possibly arose from the degradation of more complex molecules presumably existing in the coal. The loss of energy in the making of power gas was under 25 p.ct., while the oil carried with it a further 10 p.ct. of the energy of the fuel. In making smokeless fuel, the loss of energy is under 2 p.ct. The capital cost of the plant (on a pre-war basis) for handling one ton of coal per hour, including scrubbers, blowers, &c., comes to about £1000.

Yorkshire Junior Gas Association.—Members of the Association are next Saturday week to visit the works of their President, Mr. J. E. Lister Cooper—that is, those of the Yeadon and Guiseley Gas Company, where they will inspect the recently erected carbonizing and coal-handling plant, which was described by Mr. Cooper to the Association some time ago [see "JOURNAL" for May 16, 1916, p. 338]. After the inspection, tea will be provided by the Directors of the Company.

REGISTER OF PATENTS.

Production of Ammonia.—No. 103,148.

Perry, F., of Tipton, Staffs.

No. 538; Jan. 12, 1916.

This invention relates to the synthetic production of ammonia by passing Mond or producer gas over heated iron, or a mixture of such gas with steam over heated coke or other carbonaceous material, at or near atmospheric pressure and at a temperature of 650° to 700° C. The patentee remarks that various processes have been devised for this purpose—the best known consisting in passing mixtures of hydrogen and nitrogen, with or without the association of other gases, over certain heated bodies, such as iron, which apparently serve as catalysts in the required reaction.

In one convenient manner of carrying the invention into effect, the Mond or other gas is simply passed through heated iron pipes raised to the temperature named. The function of the iron is probably assisted by the presence of the constituents of the gas other than the hydrogen and nitrogen. The ammonia synthesized in the operation is removed by passing the gas through sulphuric acid in the well-known manner. Preferably the gas is again likewise treated; and after each operation the ammonia is removed. After having obtained the maximum yield of ammonia, the gas is still useful for power and heating purposes.

In another way of carrying the invention into effect a mixture of Mond or similar gas and steam is passed through heated iron pipes. The material of the latter may still act as a catalyst; but it is more probable that it serves mainly, if not entirely, to dissociate the steam and produce nascent hydrogen, which immediately combines with the free nitrogen of the gas, while the oxygen of the steam combines with the iron.

Alternatively, the gas and steam are passed over heated carbonaceous matter (coke) contained either in iron tubes or chambers of refractory material. In this case the coke serves apparently to effect dissociation of the steam—the hydrogen combining with the nitrogen, and the oxygen with the coke. This process is preferable to the one previously described—in that oxidization of the iron is minimized or avoided, and the waste is confined to the coke.

By this invention use is made of gases which are cheap and readily procurable in large quantities, and to produce greater yields of ammonia than are ordinarily obtainable in synthetic processes at or slightly above atmospheric pressures.

Atmospheric Gas-Burners.—No. 103,837.

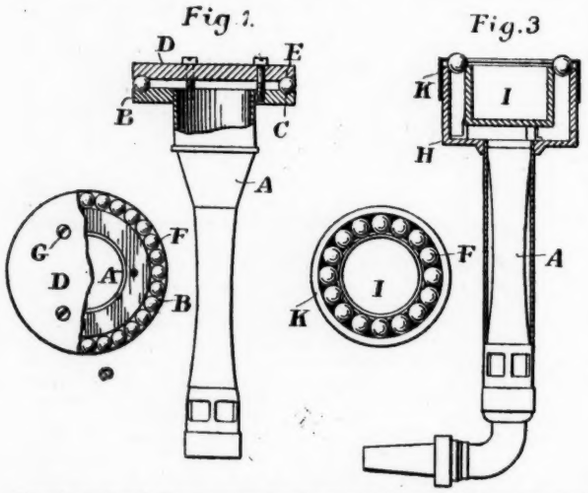
South Metropolitan Gas Company and Chandler, D., of Old Kent Road.

No. 1378; July 26, 1916.

This invention relates to atmospheric gas-burners in which metallic balls are so disposed that the air and gas mixture passes between and around them on its way to the point of ignition.

Hitherto the balls have been arranged with a view to ensuring a thorough mixture of the air and gas, and have been placed in mass in the mixing chamber or in the burner head. But the patentees state that it has now been found that, "apart from any mixing effect, by arranging metal balls in a single row or layer in the burner-head, close to the point of ignition, a number of separate jets are obtained and complete immunity from lighting-back is ensured."

Sectional elevations and plans of two forms of burner are shown.



Chandler's (South Metropolitan Gas Company) Atmospheric Gas-Burners.

In fig. 1 the mixing tube A is surmounted by an annular plate B, with an annular recess C on the top side of it. D is a solid plate provided with a recess E similar to C; and balls, arranged in a ring in the recesses, serve to keep the plates apart and provide a space for the passage of the gas mixture which is ignited at the circumference of the plates. In this burner the flame starts in a horizontal direction.

In fig. 2, a vertical flame is provided for. The mixing tube is surmounted by a cup H, of wider circumference than the tube and having a central orifice at the bottom open to it. I is a cup with a closed bottom standing on feet within H. The balls are supported between the inner and outer upper edges of the cups, and are secured against displacement by the ring cap K.

Apparatus for Conveying Retort Charges from One Level to Another.—No. 103,697.

White, A. F.; a communication from the Riter-Conley Manufacturing Company, of Leetsdale, Penn., U.S.A.

No. 1928; Feb. 9, 1916.

This invention, of "apparatus for conveying charges of material from one level to another," is especially applicable to coal-gas manufacturing plant in which a portion of the residual coke in the retorts is fed into producers for generating gas for operating the plant—the chief object being "to facilitate and expedite the manipulation of the receptacle employed for transferring the coke." It is also an incidental object to provide means for weighing and registering the weight of all coke fed to the producers, so as to record the amount of coke charged into the producers in a given time. A further object is to provide a producer charger which, owing to its rapidity of operation, is especially adapted for use with high-speed charging and discharging machines for coal-gas plants.

The apparatus is similar in character to the weighing apparatus described in patent No. 12,142 of 1915; but it differs from it in that it is adapted to convey or transfer charges of material from one level or location to another. The apparatus receives and discharges loads and is adapted to be balanced by a displaceable poise, which is effective as a weight factor in moving the receptacle between levels and ineffective during the loading and unloading operations. The arrangement is such that the movements of the displaceable poise are always directed towards the point of balance and employed solely for balancing or poising the receptacle in either the loaded or unloaded condition. The material receiving receptacle is supported by a rocking beam provided with a traversing poise or weight actuated by a reversible electric motor or other power device so as to always assume a beam-balancing position.

It has previously been proposed, the patentees point out, to employ apparatus for conveying material from one level to another which comprises a receptacle carried by a horizontally pivoted arm provided with a displaceable poise adapted to balance or poise the receptacle in the loaded or unloaded condition, so as to eliminate the weight factor of the receptacle during the movement of it. Such apparatus, however, it is said, presents the objection that the poise has to be moved away from the point of balance in advance of either loading or unloading action, and subsequently returned to the point of balance prior to the movement of the receptacle—an operation which precludes the use of automatic poise displacing means, and necessitates the manual operation of the poise, and so results in "an extremely low speed of operation."

The invention is further described in the course of a lengthy specification, accompanied by four sheets of closely-lettered diagrams. No less than fourteen claims are made for the arrangement.

Increasing the Heating Power of Coke.—No. 103,893.

Rollason, A., of Long Eaton.

No. 3196; March 3, 1916.

The object of this invention is to subject coke to a treatment by which "a more complete combustion results and a much higher temperature is obtained."

The grade of coke preferred varies between 1½ to ¼ in. diameter; and to it is added a percentage of finely ground calcium or magnesium carbonate, varying between 1 and 3 p.ct., according to the temperature of combustion required. Upon heating the carbonate and coke, the carbonate takes up heat and is decomposed. "The carbon dioxide liberated, by its action on the carbon, reduces the conducting power for heat which it acquired when in the retort during carbonization of the coal, and increases its avidity for oxygen, which it now takes up freely, and a higher temperature and complete combustion results."

Preventing the Disintegration of Refractory Materials.—No. 103,953.

Barrett, M., and the Leeds Fire-Clay Company, Ltd., of Leeds.

No. 11,751; Aug. 18, 1916.

The invention relates to the treatment of refractory materials intended for use in the oven walls of gas-retorts, bye-product coke-ovens, and the like.

Immediately they are made, and while of a leather-like consistency, the blocks are polished on the surfaces to be treated by soft leather or rubber, and then air-dried as usual and subsequently placed in the kiln. At the end of the kilning operation, and while still incandescent, they are brought into intimate contact with the hot vapour of an alkaline chloride or chlorides (such as chloride of sodium) produced by heating the alkaline chlorides sufficiently high to vaporize them. This treatment results in the formation on the parts which are afterwards in direct contact with the coal during carbonization, of a thin surface film or "chemical resistant veneer" which, being highly polished, effectively prevents disintegration.

The process differs from salt-glazing in the generally accepted meaning of the term, as in the first place the reaction is not continued for a sufficient length of time for the formation of a glaze, and, in the second place, the ordinary salt-glazing process is dependent on the surface of the material in contact with the salt vapour being porous, so that penetration by the vapour into the pores of the material can take place, which results in the formation of a proper glaze. In the present process, on the contrary, the surfaces before kilning are dense and impermeable, due to the polishing, and no penetration of vapour can occur.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Intrinsic Brilliancy and Inconsistency.

SIR,—I regret that in your editorial remarks [Feb. 27, p. 394], on the question connected with intrinsic brilliancy which I raised at the last meeting of the Illuminating Engineering Society, you have somewhat obscured the real issue, and allowed the matter which I believe to be of general interest to appear a "party" question. If your readers wish to know what I really said, I would refer them to your report of the proceedings on p. 408 in the same issue.

It is an unquestionable fact that the figures of intrinsic brilliancy of various illuminants, as given by Stockhausen and others, do not constitute an accurate measure of the amount of dazzle emitted by those illuminants. Let me ask you to look successively at a 30 c.p. gas-mantle and a 30 c.p. metal filament lamp, and then tell me if the latter is thirty times as dazzling as the former. Of course, not! Yet this is what figures of intrinsic brilliancy would lead us to believe; and it was in the hope that Dr. Kerr would be able to offer from the ophthalmic point of view some explanation of this discrepancy, that I raised the question.

You suggest that "the large spaces between the filaments [of an electric lamp] give them stronger definition." I agree. But is not that the exact point for which I am contending; for what does "stronger definition" mean but that the eye, being less dazzled, can see more clearly? In other words, the spaces between the filaments of a lamp render it less dazzling than the accepted figures of intrinsic brilliancy would lead us to believe.

My observations on the filament of an electric lamp and the mesh of a gas-mantle were merely illustrative of the inconsistency which is found in the measurement of intrinsic brilliancy. In the one case, the exact projected area is measured; whereas in the other case the luminous source is assumed to be solid. In the course of my work of testing gas-burners, I have found mantles in common use in which the openness of mesh is such that at least half the projected area is space. Why, then, call it solid? Mr. J. G. Clark's reply—and he brought out facts to substantiate it—was that the mantle is an *apparently* solid source of light. This I fully admit. But if you thus take the *apparent* area of a gas-mantle, you must equally (as Mr. Trotter insisted) take the *apparent* area of a metal filament electric lamp, which latter idea you ridicule.

The only question for discussion is how this area may be defined. I did not offer a solution; certainly I did not say that the total area occupied by the filament, inclusive of dark spaces, should be taken as the area of the source; but I did suggest that somewhere between this and the exact projected area of the filament lies the apparent area, which would enable us to make a fair comparison.

I am strongly of opinion that some figure other than the intrinsic brilliancy as given in text-books, and one that takes into account the apparent luminous area, is required to give a useful measure of the dazzle from an illuminant; and I would ask you not to obscure this issue by accusing me of trying to minimize the evils of high intrinsic brilliancy. Personally, I think that modern high-power illuminants—whether gas, electric, oil, or acetylene—are, from the ophthalmic standpoint, all tarred with the same brush.

With regard to the last sentence of your editorial, I have yet to learn that the impartiality of the platform of the Illuminating Engineering Society can in any way be violated by raising a question of general scientific interest.

ARTHUR CUNNINGTON.

26, *Muncaster Road, Clapham Common, S.W.*,
March 8, 1917.

[A comment on this letter appears on p. 502 of this issue.—ED. G.J.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Street Lighting and Accidents.

Mr. BOWERMAN asked the Home Secretary whether, in view of the increasing number of fatal accidents within the London area, due to the insufficient lighting of the streets, he would consider the necessity, in the interests of the public safety, of consulting the responsible authorities in order that street lighting might be materially increased.

Sir G. CAVE replied that he could not agree with the suggestion that the increase in the number of fatal accidents was wholly or mainly due to the darkening of the streets. The number of such accidents occurring in daylight had increased in almost exactly the same proportion as those occurring at night. He did a short time ago, after taking the advice of experts on the subject of the lighting of the streets in war time, have a consultation on the matter with the military authorities and with representatives of the local authorities in London, with the result that alterations had been, or were being, made in the method of obscuring the public lamps which would, he hoped, considerably improve the diffusion of light in the streets.

Successful Salford Gas-Mains Appeal.—At the last meeting of the Salford Gas Committee, a report was presented and approved as to the appeal of the Corporation against the gas-mains assessment in the out-districts for the year 1916-17. As a result of the appeal, the Assessment Committee stated they were prepared to fix the assessments on a basis of 5 p.ct. of the gross rentals for the year ended March 31, 1916, during the period of the war, which had resulted in a net reduction of £643.

LEGAL INTELLIGENCE.

CONTRACTS AS AFFECTED BY THE MINISTRY OF MUNITIONS ORDER.

A case was in the Appeal Court last week which is of interest to "JOURNAL" readers though not affecting directly the concerns of gas undertakings. It was an appeal by the defendants in a case involving an important matter concerning constructional work during the war and the powers of the Ministry of Munitions. In the Lower Court, the decision was against the defendants, but the appeal was allowed, with costs.

Defendants contracted with plaintiffs (a public body) to construct certain works for £673,000—to be completed in six years from Aug. 16, 1914. Under the contract all tools, plant, and materials brought on the site of the work were to become the property of the plaintiffs until the work was completed. At the beginning of 1916 it was found that, owing to the difficulty of obtaining labour, the work could not be completed within the time specified; and on Feb. 21 last year the Minister of Munitions ordered the contractors to cease work, and to hold their plant and labour at the disposal of the Ministry. At the direction of the Ministry the contractors removed a large quantity of plant and sold it to owners of munition factories—receiving for it £42,000 on behalf of the Ministry of Munitions. An action on this subject was brought before Mr. Justice Bray, for a declaration that the contract was binding, and that the plaintiffs were entitled to all the plant on the site, and to the proceeds of the plant which had been sold; alternatively, for damages for conversion, and an injunction preventing further removals. Defendants pleaded that the contract was terminated by the action of the Ministry of Munitions, and that the property in the plant was reinvested in them. Mr. Justice Bray held that the plant on the site on Feb. 21, 1916, was the property of the plaintiffs; but that as the Ministry of Munitions had power to sell any plant removed to munition factories, the plaintiffs were not entitled to the proceeds, or to damages for conversion. He granted an injunction restraining the contractors from removing any further plant, except such as they might be ordered to remove by the Ministry of Munitions.

From this decision defendants appealed; and by their judgment the Court—consisting of the Master of the Rolls and Lords Justices Warrington and Scrutton—allowed the appeal, holding that the contract was dissolved. They also discharged the injunction restraining the appellants from removing the remaining plant.

Charge Under the "Conspiracy and Protection of Property Act."

At the Gosport Police Court, a charge was recently preferred against a stoker named George E. Bull, in the employ of the Gosport Gas and Coke Company, for breach of contract with his employers by absenting himself from duty on five days out of seven. The case was brought under the Conspiracy and Protection of Property Act, 1875. The Solicitor for the Company said they were responsible for the supply of gas to the district under Act of Parliament, and 30 p.ct. of their output was required by Government establishments, as well as various bye-products for the production of high explosives. The defendant was a badged man; and his absence from work jeopardized the operations of the Company. His default was, therefore, most serious, as the prosecutors had at the time no reserve stokers. He was utterly indifferent to warnings; for on the Monday after the summons was issued, he was again absent. It was stated that the Company did not press for a severe penalty, but took proceedings as a warning to defendant and others. In giving evidence, Mr. Edwin Allison, the Company's Engineer, stated that the defendant had lost 25 p ct. of his time this year. If he was ill, it was required that he should send a medical certificate; but this had not been done, nor was any excuse given. The defendant pleaded guilty, and attributed his absence from work to illness. He was fined £2; the Chairman of the Bench stating that he could regard himself as fortunate in not being sent to prison.

Advisory Boards for Coal Mines Control.

The Board of Trade announce that, in the Department of the Controller of Coal Mines, an Advisory Board representative of the coal-owners and the miners in the various districts has been attached to the Controller. It consists of the following: For the coalowners.—Mr. Adam Nimmo, Mr. Arthur Pease, Mr. C. E. Rhodes, Sir T. Ratcliffe-Ellis, and Mr. Bramwell. For the miners.—Mr. Robert Smillie, Mr. W. Straker, Mr. Herbert Smith, Mr. Stephen Walsh, M.P., and Mr. Vernon Hartshorn. The Controller will also be assisted in the financial administration by a Board of Financial Advisers, consisting of Mr. A. H. Gibson, F.C.A. (President of the Institute of Chartered Accountants), Sir Woodburn Kirby, F.C.A., and Mr. A. Lowes Dickinson, F.C.A. Sir Richard Redmayne, K.C.B. (Chief Inspector of Mines), will assist the Controller in matters relating to the production of coal; and Mr. S. H. Hunt (of the London and North-Western Railway) in those relating to distribution. Mr. H. F. Carlill is acting as Secretary to the Department. The Coal Controller will confer with the Board on general questions of policy affecting the industry.

Gas Profits at Kendal.—Having had an estimate of the gas profits for the year ending the 31st inst., and taken into consideration the fact that £1000 has been invested in the War Loan, the Kendal Corporation have decided that it is not desirable to transfer any sum to the rates out of the profits.

MISCELLANEOUS NEWS.

"SUMMER TIME" COMMITTEE'S REPORT.

Economies to be Expected in Artificial Light.

Last week the report was issued of the Committee appointed by the Home Secretary to inquire into the social and economic results of the Summer Time Act, 1916, and to consider (i) whether it is advisable that "Summer Time" should be reintroduced in 1917 and in subsequent years, and if so (ii) whether any modifications in the arrangements are required, and (iii) between what dates "Summer Time" should be made operative.

After giving a historical account of the scheme of the late Mr. William Willett, F.R.A.S., and the various measures introduced into Parliament (but not further proceeded with) in the sessions 1911-14, and the resolution passed in the House of Commons in 1916, by a majority of 170 votes to 2—"That, in view especially of the economy in fuel and its transport that would be effected by shortening the hours of artificial lighting, this House would welcome a measure for the advancement of clock-time by one hour during the summer months of this year"—the enactment is referred to of the "Summer Time Act, 1916" and its being put into force from May 21 to Sept. 30 of last year. The Committee point out that it was expressly stated by Mr. Herbert Samuel, and generally understood in the country, that the immediate object of the Act was to effect an economy in the consumption of coal, oil, and other fuel used in the production of artificial light. Following, however, the instructions in the terms of reference, they did not confine their investigations to the question whether this particular purpose was achieved—in fact, the major part of their inquiry has been concerned with the more general question whether one season's experience of the Act has in general confirmed the anticipations of its supporters as to its beneficial effects, or the apprehensions of its opponents as to the difficulties and disadvantages likely to arise from its operation.

Detailing the method pursued in the inquiry, the report points out that the Committee in the first instance addressed a series of questions to a very large number of authorities, organizations, and individuals; and by this means they obtained the general views of every section of the community in regard to the effects of "Summer Time." In their circulars to industrial and commercial associations, individual manufacturers, and co-operative societies, was included a question as to the reduction in consumption of artificial light. But it was obvious to the Committee that, so far as gas and electric lighting were concerned, the only bodies who were likely to be in a position to furnish materials for a general estimate were the gas and electric light undertakings. After consulting the Board of Trade, they were able to arrange for the distribution of carefully-worded inquiries on these points to a considerable number of such undertakings in all parts of the country. The Institution of Gas Engineers undertook the distribution to gas undertakings; and it is mentioned that, among the witnesses who gave evidence before the Committee, were—as representing gas undertakings—Mr. W. T. Dunn and Mr. W. E. Price (Secretary and Hon. Secretary of the Institution of Gas Engineers), Captain R. S. Hilton (Manager of the City of Birmingham Gas Department), Mr. H. E. Jones (President of the National Gas Council), and Mr. Hanbury Thomas (Managing-Director of the Sheffield United Gaslight Company).

The report proceeds to give a general summary of the evidence adduced under the headings of: Public health, public morals and order, workers' interests, children's sleep, trade, industry (other than agriculture) and commerce, economies in artificial light and fuel [refeared to, *in extenso*, later on], agriculture, later closing of shops, early morning lighting in the cotton trade, meteorological work, and the alteration of clocks.

The Committee took steps to obtain information as to "Daylight Saving" schemes in the Colonies and in Foreign Countries; but not much definite information of particular interest to "JOURNAL" readers resulted. The evidence from Sweden was apparently rather favourable, so far as town life is concerned. While the saving in light and fuel does not appear—from the Press accounts—to have been great, one newspaper reports an estimated saving of 50,000 kroner (about £2800) to the inhabitants of Gothenburg on electric current, and 2500 kroner (about £140) on coal used in the production of gas. The Prussian Government have made elaborate inquiries among all the interests concerned; and a number of German and Austrian newspapers have also been conducting researches on their own account. The evidence from trade, commercial, and industrial sources, and from town interests generally, seems to have been distinctly favourable. Striking instances are given of saving in artificial light and fuel in various large cities—*e.g.*, at Berlin the municipal gas-works were able to report a decrease during May and June of 508,500 cubic metres, notwithstanding the fact that 18,000 new gas-meters were put up during the first six months of 1916; and the records from January to April showed an increase of 2·4 million cubic metres output of gas as compared with 1915.

The following is a summary of the Committee's recommendations:

I. That "Summer Time" should be renewed in 1917 and in subsequent years.

II. That the period of the operation of "Summer Time" should be from the second Sunday in April to the third Sunday in September in each year.

III. That the change from normal to "Summer Time" should be made on the night of Saturday-Sunday, and the reversion to normal time on the night of Sunday-Monday.

IV. That the variation from normal time should be one hour throughout the whole period.

ECONOMIES IN ARTIFICIAL LIGHT AND FUEL.

We may now give, practically in full, the sections of the report dealing with this matter.

The Committee made extensive inquiries on the subject among gas and electric light undertakings, and also included a question on the subject in their circulars to industrial and commercial associations, individual employers, and co-operative societies. In the questions put to gas and electric light concerns, they asked for estimates (*a*) of the percentage of reduction in the consumption of light during the "Summer Time" period, (*b*) of the consequent saving in the consumption of coal or other fuel, and (*c*) of the actual saving in expenditure by consumers of artificial light, due in each case to the operation of the "Summer Time" Act alone—allowance being made so far as possible for other influences. They realized from the beginning that the very exceptional conditions prevailing during the "Summer Time" period last year would in all probability make it difficult to arrive at any very definite estimates on these points; and, unfortunately, their apprehensions in this respect were confirmed. Although furnished with a large mass of information, they feel that for the purpose of arriving at any definite figures for the whole country it is somewhat unsatisfactory.

There were during the period so many other forces at work, often of a very conflicting nature, influencing the consumption of light and fuel, that the figures supplied were for the most part, and could only be, rough estimates. The lighting restrictions, the earlier closing of public-houses and (in many districts) of shops, the increases in the charges for electricity (made in many cases before "Summer Time" came into operation), all tended to reduce consumption during the period. On the other hand, the great increase in overtime and night work in many industrial districts, and the multiplication of factories and offices, tended to increase the consumption of light. In the case of the gas undertakings there were further complications, to which allusion is made later on. It was, therefore, almost impossible to arrive at the results of one factor only out of so many; and, owing to the lack of uniformity in the methods of allowing for the other operating influences, any general estimate based on the figures furnished can at the best be only conjectural.

As an illustration of the complexity of the problem, the Committee cite some interesting figures supplied by the Chief Engineer of the Manchester Corporation electricity works. For the three months ending Sept. 30, 1916 (during which "Summer Time" was in operation), the lighting units sold by the works showed an increase of 7 p.ct.; but a more detailed analysis of the figures for certain typical areas showed the following results: In four residential districts, there had been a marked decrease (about 15 p.ct.) as compared with the corresponding period of 1915:

	1915.		1916.
No. 1	5,186 units	..	3,931 units
,, 2	28,524 ,,	..	26,080 ,,
,, 3	36,080 ,,	..	32,059 ,,
,, 4	25,973 ,,	..	18,821 ,,

Three industrial shopping districts showed, on the other hand, a marked increase (about 8 p.ct.) which the Chief Engineer attributed to war work and the revival of retail trading:

	1915.		1916.
No. 1	70,694 units	..	74,769 units
,, 2	61,252 ,,	..	63,009 ,,
,, 3	180,180 ,,	..	199,021 ,,

This case is by no means exceptional—either among electricity or gas concerns. Nevertheless, though it proved so difficult to arrive at any accurate estimate of the economies effected in light and fuel, it is perfectly clear that the substitution of an hour's daylight in the evening during many weeks of the year for an hour's artificial light must have resulted in a considerable net saving: and this is certainly borne out by the information furnished to the Committee.

Electric Light.

Replies were received from over 80 municipal electric light undertakings, from between 50 and 60 private companies, and from 11 electric power companies. The estimates of the reduction in the consumption of electric light varied very widely—from 1·25 p ct. in one case to 55 p ct. in another. The returns from the power companies gave a mean reduction of 25 p.ct. for lighting purposes; 38 private companies furnished figures which gave an estimate of reduction varying from 10 to 41 p.ct. (the mean for the 38 being 23 p.ct.); and 64 municipal undertakings gave a mean reduction of 18·3 p.ct. in units used for lighting.

It appeared from the returns to the questions that the estimates of the saving in coal and the reduction in expenditure on artificial light were largely calculated on the basis of the estimate of the reduction in the consumption of units, and were therefore subject to exactly the same criticisms as that figure. Further, so far as the saving in coal is concerned, it is pointed out in many cases that the falling-off in the quality of the coal supplied last year as compared with previous years increased the difficulty of arriving at an accurate figure. The returns, however, showed clearly that the saving in coal throughout the country must have been considerable. One point, it is said, should be made clear in this connection—viz., that although in some few cases there may be a reduction in the consumption of coal more or less proportionate to the reduction in the consumption of artificial light, in other cases (*e.g.*, in the case of companies which supply a considerable amount of electricity for power purposes) the saving in coal may be trifling. As the plant has to be kept in readiness to supply the maximum demand, and the consumption of coal for "stand-by" is an important factor in the total consumption—particularly in summer time, when, although boiler and electric pressure have to be maintained throughout the 24 hours, the actual lighting hours are very few.

An interesting calculation as to the three main sections of the inquiry was placed before the Committee by Mr. Faraday Proctor, the Hon. Secretary of the Incorporated Municipal Electrical Association. In his calculation, Mr. Proctor assumed as his basis that the "Summer Time" period would extend from the beginning of April to the end of September. The following are his words:

> The lighting consumption in the six winter months may be taken on the average as being twice that of the six summer months. If, therefore, the diminution in consumption is taken at from 5 to 25 p.ct. for the summer

months, this corresponds to a diminution of from 1·7 to 8·3 p.ct. of the lighting consumption for the whole year.

I have extracted data from the copies of the annual accounts of all those municipalities who show the output for lighting as distinct from the output for power and other purposes; and the same indicates that the total number of units sold is 4·37 times the number sold for lighting only—that is to say, the lighting units are 22·883 p.ct. of the total units output.

The figures I have extracted relate to undertakings representing about 25 p.ct. of the total output by municipalities, or about 17½ p.ct. of the total output by municipalities *plus* companies, as returned in "Garcke's Manual," and may, I think, therefore be taken as representing a reasonable average. If these figures are accepted, then the diminution in the consumption due to the "Summer Time" Act would represent from 0·39 to 1·9 p.ct. of the total units sold per annum for all purposes throughout the kingdom.

The total units sold for all purposes by municipalities and companies is about 2000 millions per annum. At 3½ lbs. of coal per unit sold, this would represent a consumption of 3,125,000 tons of coal per annum. At 4½ lbs.* of coal per unit sold, this would represent a consumption of 4,017,000 tons of coal per annum. At 5½ lbs. of coal per unit sold, this would represent a consumption of 4,910,000 tons of coal per annum.

Owing to the standing charges, a diminution of the units sold does not result in a corresponding diminution in the coal bill. I estimate in my own undertaking (which may, perhaps, be taken as an average) that the diminution in the output would result in a saving of only 66 p.ct. of a corresponding diminution in the coal bill. Therefore, if the total units sold are reduced by from 0·39 to 1·9 p.ct., the coal bill would be reduced by (say) 66 p.ct. of this—viz., by from 0·2574 to 1·254 p.ct.; and on the table of coal consumptions above given the resultant saving in coal throughout the kingdom, in respect of the supplies afforded by municipalities and companies, would be as shown in the following table:

Total Annual Coal Consumption, and Saving in Same due to the "Summer Time" Act on Low, Mean, and High Estimates.

Estimate		Low.	High	
	Reduction in lighting units:	5 p.ct.	25 p.ct.	(Summer period only.)
	Total coal for light and power . .	Saving 0·2574 p.ct.	Saving 1·254 p.ct.	Per annum.
Low	3,125,000 tons . .	8,043 tons	39,187 tons	,,
Mean	4,017,000 ,, . .	10,340 ,,	50,370 ,,	,,
High	4,910,000 ,, . .	12,640 ,,	61,570 ,,	,,

With such widely divergent views as to the percentage reduction in the consumption of electricity for lighting, it is difficult (and perhaps presumptuous) for me to suggest what percentage figure should be accepted. But I should say that one should not look to the saving in coal exceeding from 10,000 to 20,000 tons per annum as directly attributable to the variation of one hour per day summer time for a period of six summer months. If the lighting units are as mentioned above—22·883 p.ct. of the total units—the total lighting units per annum would approximate 457,660,000. A reduction of 1·7 p.ct. in the lighting units will amount to 7,780,000 units per annum. A reduction of 8·3 p.ct. in the lighting units will amount to 37,980,000 units per annum. The average revenue from lighting is about 2·7d. per unit; and therefore the loss in gross revenue to electrical undertakers and the saving in expenditure by consumers would approximate in the case of the lower estimate to £87,520, and in the case of the higher estimate to £427,290.

A question was also addressed to electric light concerns, as to whether the charge for light had been increased during the "Summer Time" period; and it was found that this had been the case with a very considerable proportion of the undertakings. This was so with about 30 p.ct. of the municipalities, and nearly 50 p.ct. of the private companies, who replied to the circulars. In many cases, however, it was pointed out that the increase had been decided upon before the "Summer Time" Act came into operation, and was due to other causes—such as the increase in the price of coal and the cost of labour and stores; while in the other cases almost without exception it is stated that the increase last year was only partly due to the Act. It is frequently pointed out that an increase in charges will probably be necessary in future years if "Summer Time" is renewed—more particularly in the case of the smaller concerns, where lighting forms the most important part of the business.

Gas.

Replies were received from 85 gas undertakings, the majority of whom gave figures, though many emphasized the difficulty of arriving at even approximate estimates of the kind required. In addition to the influence of the lighting restrictions and of the other factors already mentioned, there was in the case of the gas undertakings the further complication of a very large increase since the summer of 1915 in the quantity of gas supplied (i) to private houses, for heating and cooking purposes in the place of coal, and (ii) in industrial districts, to munition and other factories for power. This resulted, in the case of a considerable number of undertakings, in a substantial increase in the total output of gas over the "Summer Time" period as compared with 1915. It appeared that the nature of the records kept by the majority of the undertakings did not permit of their being readily sifted for the purpose of arriving at the estimate asked for—particularly with the limited time and staff at the disposal of the management.

Accordingly, as in the case of the estimates from the electricity concerns, there was considerable diversity in the methods of calculation employed. In many instances it was not indicated what had been the basis of reckoning. The estimates of the percentage of reduction in consumption of gas for lighting purposes varied from 2 to 26 p.ct. The mean—not a very valuable figure in the circumstances—works out at about 9 p.ct. Mr. Hanbury Thomas, of the Sheffield Gas Company, suggested that a general estimate for the whole country could be arrived at from the figures of actual saving in coal given in the replies from those undertakings that use coal and no other fuel, on the following plan: The amount of coal stated by such undertakings (28 in number) to have been saved as a direct result of "Summer Time" works out in the aggregate at 1·449 p.ct. of the total annual quantity carbonized by them. The total quantity of coal used by all gas undertakings in the United Kingdom in 1915 was (in round figures), 18,000,000 tons. Reckoning 1·449 p.ct. of these figures, therefore, the saving in coal effected by gas undertakings in the United Kingdom as a result of the four-and-a-half months "Summer Time" may be put at somewhere about 260,000 tons. Further, applying the same percentage to the total annual sum spent by consumers on gas (reckoned on the total annual sales of gas undertakings* at 3s. per 1000 c.ft.) the saving in expenditure to consumers works out at about £475,000.

These estimates cannot, of course, be regarded (the report points out) as anything but conjectural; but they represent the best that can be done with the figures, and are not perhaps very far wide of the mark.

It is obvious there must also have been a very considerable saving in the quantity of oil used by gas undertakings which manufacture water gas; but, unfortunately, the Committee had not sufficient data to make it possible to form an estimate.

Evidence of Employers.

The great majority of the replies received from individual employers, from business and commercial associations, and from co-operative societies, agree in the view that, except in the case of factories which were running continuously day and night, there had been a substantial saving in the consumption of artificial light. The Secretary of the Drapers' Chamber of Trade sent out a special letter on the subject to some 200 members of the Chamber in London and in the Provinces; and 50 p.ct. of the replies furnished figures giving an average estimated saving of 22 p.ct. Similar estimates furnished to the National Chamber of Trade, in reply to a circular sent out by them to their affiliated associations and individual employers in the distributing trades, gave an average of well over 30 p ct. Estimates received from thirteen Chambers of Commerce, however, averaged under 16 p.ct.

Illuminating Oils.

Mr. E. Houghton Fry, the Secretary of the Committee for the Regulation of Petroleum Supplies, supplied a report as to the effects of "Summer Time" on the consumption of illuminating oils in this country. He estimates that the economy effected by the "Summer Time" Act in the consumption of these oils amounts to about 2½ p ct. of the consumption for the year—*i.e.*, approximately 11,500 tons. Mr. Fry adds: "This seems a very modest proportion; but it should be remembered that 11,500 tons represents two journeys by an oil-tanker, which would occupy approximately four months; and this saving, therefore, can by no means be regarded as negligible. In fact, owing to the shortage that is at present being experienced in these vessels, the result is a very welcome one."

TRAINING AND WORK OF THE CHEMICAL ENGINEER.

At their Meeting on Tuesday last week, the Faraday Society had a discussion on the training and work of the chemical engineer. As eighteen speakers took part in a three-hours' debate, and it was then found necessary to adjourn the discussion, the meeting must be adjudged a success. The position and future prospects of the chemist have received a considerable amount of attention during the past two years at the hands of the various chemical societies; and it is now generally accepted that he will play a far more important part in our national life than was formerly the case. There is large body of opinion in favour of the creation of the chemical engineer in the same way that we now have (say) gas engineers, mechanical engineers, and other types of specialists. To effect this, however, it is recognized that there must be a radical change in the educational courses for chemists; and it is around this point that the real discussion turns.

The basis of the meeting was that there should be a number of papers on different aspects of this large problem, and then a general discussion. No direct representative of the gas industry spoke, though Mr. Charles Carpenter, D.Sc., was on the list. He was called upon, but was not able to be present. Nevertheless, the various points raised have such a direct bearing on the gas industry that we give an outline of the more important of them.

The meeting was presided over by Sir Robert Hadfield, F.R.S., who, in some introductory remarks, pointed out that a very special type of chemist is required for every industry. As an example, a chemist who is well trained and suitable for the chemical industry *per se*, would probably not shine as a chemist in the industry of ferrous metallurgy. Consequently, therefore, it might rightly be said that it is not practicable, nor should it be proposed, that, while there must be common ground on basic facts relating to the training of our engineering chemists, no one routine training covered all the requirements. The indication rather was that, somewhat earlier in his training, the student should more or less branch-off into specially studying the particular lines of work with which he expects to be associated during his career. When dealing with engineering chemistry, a word of reference might be made to the State organization of scientific research. It would be interesting to know on what new lines our Advisory Council for Scientific and Industrial Research would proceed in the near future. Would it distribute the large sums that were spoken of, running into seven or eight figures, or were these rumours in the realms of fancy only?

The discussion was opened by Sir George Beilby, F.R.S., who, as one of the earliest users of the term "chemical engineering," defined the expression as having for its function the design and construction of apparatus required for carrying out chemical processes on a manufacturing scale. This definition was generally accepted as being the correct one. The past laboratory training in chemistry, he contended, has led to a narrow individualism, which might be a serious disqualification for the work of the factory. Some other speakers were

* Mr. Proctor considered this to be the most reasonable figure to take as an average. The figure varied. In Bristol it was 4½ lbs.; in Manchester, 3½ lbs.; but in other places, it would be considerably higher.

* According to the "Board of Trade Returns" for 1913, *plus* 6 p.ct., which Mr. Hanbury Thomas thinks might be added to represent the increased consumption since that year.

bolder, and said the laboratory training was a drawback in this sense. Consequently, argued Sir George, a certain amount of engineering training must be included in the education of the majority of those who proposed to take up the work of industrial chemistry. He said "majority" advisedly, because he held very strongly that in the later years of the four years' course, which ought to be regarded as the absolute minimum for all serious chemists, the heads of departments in the university and college training laboratories ought to be in a position to differentiate the various leading types of students into investigators, routine workers, and men of administrative ability. After the third year of chemical and general scientific training, students who had shown special aptitude in engineering might be given facilities for gaining engineering experience in the workshop and drawing office. The successful engineer did not, as a rule, take the standpoint of the chemist seriously, and, so far as his experience went, it was only rarely that the engineer got so far into the inner circle of chemistry that he could himself look at chemical problems from the chemist's point of view. On the other hand, it was not so unusual for a trained chemist who had some natural aptitude in mechanical matters to acquire the engineer's point of view. It was this fact which justified the inclusion of as much engineering as possible in the training of chemists for industry.

The training of the chemical student for work in the factory was the subject touched upon by Prof. F. G. Donnan, F.R.S. He classified the types of student into: (1) Research chemists, the need for whom was laid great stress upon by himself and subsequent speakers; (2) engineer-chemists—*i.e.*, chemists with engineering training; and (3) chemical engineers—*i.e.*, engineers with a certain knowledge of chemistry. He strongly condemned the system by which engineers with but little or no knowledge of chemistry design, erect, and control chemical plant and processes, and even act as process managers and general works managers.

While on this point, it may be mentioned that Dr. E. F. Armstrong alleged that hundreds of plants erected during the past eighteen months have failed to work for this reason; and Lieut. Goodman mentioned cases in which the chemists, not having been consulted as to the plant which they have ultimately to use, have withdrawn all interest in the constructional stages; and the result had been failure.

In aiming at the production of the chemical engineer in the broadest sense, emphasis is placed upon the necessity for the curriculum being as wide as possible; and reference was made both by Prof. Donnan and Mr. A. P. M. Fleming to what is being done at the Massachusetts Institute of Technology, which is the engineering school for Harvard University. It is felt by some that in the future competition in the chemical industry we have more to fear from America than any other country, and that the new methods of training chemical engineers there will play an important part in the effectiveness of this competition. On the other hand, it is held by others that the organization of the chemical industry here is now such that the fear of effective competition from America, or, indeed, elsewhere, is less than it was a short time ago. Sir Robert Hadfield almost welcomed competition from America, happy in the belief that it would be fair and honest competition, and not of the "peaceful penetration" type so beloved of a country whose name does not bear mention among honest nations.

However this may be, the course of training for chemical engineers in America is arranged over a period of five years, with a review of the capabilities and aptitude of the students at the end of three years, in order that they may, as Sir George Beilby suggests in his scheme, be directed into the channel best suited to them. Generally this met with approval; and the only criticism of it, which came from Prof. E. G. Coker, was as to the subjects covered. There is a great outcry for breadth of view in the training of chemical engineers; but Prof. Coker, who has had experience of teaching in Canada, where the methods are precisely similar to those in the United States, think that the number of subjects included—about a hundred—far too many to be thoroughly gone into in the sixty months available over the five years. He prefers the British method of taking fewer subjects and dealing with them thoroughly, and added that on the other side of the Atlantic the students who entered for these courses either got through them or became imbeciles—the survival of the fittest.

Another important feature of the American system is that the Universities work in conjunction with certain affiliated industries in which their chemical students spend part of their time. Already something of the sort is being done here on a small scale. But it is a beginning of a co-operation between the universities and manufacturers in a branch of industry where it never before existed; and this is the satisfactory point.

Above the need for a modification of the training is the still greater one of offering adequate inducements for men of brains to come into the profession. Difficulties are now encountered in placing men without means, but with undoubted brains, in sufficiently well paid posts. This is really a point for the manufacturers and employers to think over; but judging by what one or two of them had to say, inducements will be held out when the real chemical engineer is forthcoming, because in him is visualized the individual who will be more than, in the words of Prof. Donnan, a so-called analyst and general hanger-on to the coat-tails of the engineer-manager. In other words, he will become the chemical engineer-manager himself, and his whole status will have changed.

On the whole, there is very little divergence of opinion among those who have taken this matter up. All are agreed as to what is wanted; and it should be a simple matter to sift the various ideas, in order to arrive at some definite plan of action. Perhaps something tangible will have evolved by the time the discussion is resumed next month.

Heavy Output at Darlington.—At a meeting of the Darlington Town Council, Mr. Dixon stated that January and February were heavy months at the gas-works. In January 51,750,000 c.ft. were made; and in the week ended Feb. 7, over 12,000,000 c.ft.—about 500,000 c.ft. better than any previous week. In the 24 hours ended Feb. 6, nearly 1,956,000 c.ft. were made. February's output showed an increase of 21·65 p.ct. He thought they would be able to get all the coal they required.

STRETFORD COUNCIL AND THE NEW STANDARD.

Decision of the Board of Trade.

The application of the Stretford Gas Company to the Board of Trade for a calorific standard of 500 B.Th.U., in place of an illuminating power standard [*ante*, p. 310] was the subject of further reference at last Tuesday's meeting of the Urban District Council. In a previous communication, Mr. Garnham Roper, of the Board of Trade, intimated that the Board had carefully considered the various representations which had been made to them in regard to the application, together with the Company's observations thereon; and they had decided to make an Order, substituting a calorific standard of 500 B.Th.U. for the Company's present standard of illuminating power. The conditions imposed under the Order were:

1. That the minimum pressure of the gas supplied by the Company shall be 15-10ths of an inch.
2. That the Company shall supply flat-flame burners suitable for the gas supplied to all consumers applying for them within two years from the date of the Order, in substitution for flat-flame burners in use at the date of the Order.
3. That the Company, or any body or person who may appear to have a substantial interest in the matter, may apply to the Board, after the expiration of five years from the date of the Order, for the reduction or increase of the standard of calorific power or minimum pressure fixed by the Order.

The Council, upon receipt of this communication, decided to protest against the Board arriving at a decision without giving them an opportunity of being heard upon the application; and they drew the attention of the Board to certain recommendations made by their Consulting Engineer (Mr. Isaac Carr, M.Inst.C.E., of Widnes), in regard to the Company's application. They suggested that, having regard to the Company's obligation to conform to the statutory standard of 16 c.p. ascertained by test with Sugg's "London" argand burner No. 1, the calorific standard in the proposed Order should have been fixed at 550 B.Th.U., with a 5 p.ct. margin, as in the case of the Liverpool Act of 1914 and the Hightown Gas Act of the same year. They further considered that the place of test should be such as might be agreed between the Council and the Company, or as, failing agreement, might be determined by the Board of Trade.

Subsequently the Clerk to the Council announced that a further communication had been received from the Board stating that, before deciding to grant the Company's application for an Order, they had given careful consideration to representations made by the Council, the reply of the Company thereto, and the rejoinder by the Council.

With regard to the request of the Council for a calorific standard of 550 B.Th.U. with a margin of 5 p.ct., the Board were advised that, in the absence of agreement between the parties, Parliament had in no case authorized a penal limit of calorific power higher than 500 B.Th.U. gross. They had decided, when granting the Order to the Stretford Gas Company, to allow a standard of calorific power and a penal limit which had been adopted by Parliament in recent legislation—viz., 500 B.Th.U. gross. In regard to the position of the testing-place, the Board proposed to provide in the Order that it should be that already prescribed in the Company's Acts. Further, the Board did not propose to make the Order until advised by the Ministry of Munitions that the crude benzol recovery plant erected by the Company was in operation.

After the reading of the Board of Trade decision, the Legal and Parliamentary Committee resolved that the Council ask that the operation of the Order be limited to the duration of the war, and not five years; and at last Tuesday's meeting of the Council, the minutes of the Committee were unanimously approved.

Stretford Gas Company.

Mr. Edwin Hibbert (the Deputy-Chairman), presiding at the meeting of the Company, reported that the balance-sheet, made up to Dec. 31, 1916, showed a net profit for the half year of £4639. Adding to this the balance from the last account, made the amount disposable £6142. The Directors recommended dividends at the rates per annum of 10 p.ct. on £25,000, and 7½ p.ct. on £14,000 of original shares, 7 p.ct. on £61,000 of "A" shares, and 5 p.ct. on £40,000 of "B" shares. This would absorb £4910, leaving £1232 to be carried forward. The accounts were unanimously adopted; Mr. Hibbert remarking that the fact that the net profit was about £270 less than the sum required to pay the dividends was due to two causes—the high price of coal and oil and all materials, and the fact that the expenses of 1916 were greatly in excess of the corresponding period of 1915, because the Board thought it desirable in the earlier year to expend as little money as possible, and the money had to be spent in 1916. They had applied to the Board of Trade for an Order to substitute a calorific standard of 500 B.Th.U. for the present illuminating power test; and the Board had intimated that they would issue the Order as soon as ever the crude benzol recovery plant they were erecting was in operation. In order to protect the interests of consumers and shareholders, the Company had thought it necessary to apply to the Board of Trade for a Provisional Order for working-up residual products on land which was outside the scope of the original Stretford Gas Act. They had power to work-up residual products already; but this was on land that was covered by gas-works buildings. He considered that the opposition of the Urban District Council to the Order, and the demands they had formulated as a condition of their consent being given to it, were unreasonable.

The Leeds Corporation have arranged that a war bonus is to be granted to female gas inspectors on the same scale as to female tramway conductors—namely, after three months' continuous service, one-half of any war bonus then being paid to the men; and after twelve months' continuous service, full war bonus as paid to the men.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Monday of last week, at No. 5, Great Winchester Street, E.C.—Mr. ARTHUR F. PHILLIPS in the chair.

The ACTING SECRETARY (Mr. Charles Chambers, the Engineer and Manager) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

THE LATE AND THE NEW ENGINEER AND MANAGER.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, since the last meeting, they had lost their excellent Secretary and Engineer, Mr. James L. Chapman, who had been the Company's chief officer since its formation in 1873. In that year, the sale of gas was only 12 million cubic feet. It had grown under his administration till the output last year was 335 millions. Of course, the limits of the Company's district as defined in their Act of 1873 had been largely extended by subsequent Acts; but the care and attention Mr. Chapman gave to the business greatly contributed to its success. The Harrow Company was his first and predominating thought; and, until his health began recently to fail, most of his time was spent in the Company's service. He was courteous to all, and preserved the most excellent relations with the various public authorities and private consumers. He was most considerate for all the officers and men in the Company's service. They regretted his loss as one who for 44 years had faithfully served the Company; and they deeply sympathized with those he had left behind to bear such a bereavement. Mr. Chambers, who had been in the Company's service 26 years, and who for some time past had had charge of the gas-works, had been appointed Engineer and Manager. The Directors had every confidence that, under his supervision, the efficiency of the past working would in future be fully maintained.

GOOD RESULTS UNDER WAR CONDITIONS.

The past half year showed a result corresponding in efficiency to the one which preceded it. The only additions to capital were for meters £580, and stoves £919. Against this £2747 was written-off for depreciation of meters and stoves; so that the capital expenditure was £1247 less than at the close of the previous account. The capital expenditure was now reduced to 14s. 7d. per 1000 c.ft. of gas sold. When this was contrasted with what the capital expenditure was a few years ago, the proprietors had much upon which to congratulate themselves. The quantity of gas sold was 171,995,000 c.ft.—an increase on the previous year of 4,302,000 c ft. Considering there was the economy due to the Daylight Saving Act, this was highly satisfactory—the increased consumption followed the extended use of gas for cooking and heating. During the half year there was an addition of 180 consumers, 542 additional cooking and heating stoves, and 34 hot-water circulators. The demand for stoves had been great; but, unfortunately, owing to the number of fitters taken for military service, it was difficult to comply with these requests. The cost of coal and all material required for a gas-works continued high; and the difficulties in obtaining supplies had been considerable. There had also been anxiety in carrying on the business by reason of the number of employees taken for military service. The number of employees before the war was 142. Of these 45 had gone for military service, and some had left for other causes. The total, with substitutes, was now reduced to 124. It would be seen from the revenue account that coal cost £11,228, against £9849 in the corresponding half year, although the quantity carbonized was only 198 tons more. The wages for the manufacture of gas were £1114, compared with £885, due to a more correct allocation of wages and increased rates of payment. Repairs of works cost £634 less, and repairs and maintenance of mains and services were also lower by £1008. All other charges remained much the same, except the war allowances, which had increased from £540 to £950. This had become a serious charge; but it must be cheerfully borne for the sake of those brave men who had gone forth to protect their country. The gas-rental had increased from £31,342 to £32,232; but the receipts for products had only gone up from £6509 to £6749. The profit on the half-year's working was £8127, against £8017—an increase of £110. This, added to the £12,731 brought forward, and deducting £1102 interest on debentures and loans, and £2634 for income-tax, left £10,429 available for the proposed dividend, which would absorb £6772, and leave £3656 to carry forward to the next account. The Directors realizing that it was incumbent on all to assist in the War Loan had invested £2000, and had also converted the previous investment in the 4½ p.ct. loan.

OTHER ITEMS OF INFORMATION.

The Board considered it advisable to employ in the preparation of the accounts a properly qualified, independent accountant, and had appointed Mr. Ernest L. Burton—a gentleman who had a large experience in gas accounts. The Company was now of a size to make such supervision desirable. This was the third year in which Directors and proprietors met with the war cloud hanging over them, and causing so much anxiety. Though the Company was much inconvenienced by the number of men taken for military service, the staff had met all difficulties; and they had every hope of being able to satisfactorily maintain the Company's position. The Company were taking steps to meet the requirements of the Government for benzol by the erection of a plant for its extraction, and had applied to the Board of Trade for an Order to replace the illuminating power standard of gas by a calorific standard.

The DEPUTY-CHAIRMAN (Dr. J. W. Lee Glaisher, F.R.S.) seconded the motion, which was unanimously agreed to.

OTHER BUSINESS.

Moved by the CHAIRMAN, and seconded by Mr. A. M. PADDON, dividends were declared at the rates of 5½ p.ct. per annum on the 5 p.ct. ordinary stock, and 5 p.ct. per annum on the 5 p.ct. preference stock, both less income-tax.

The DEPUTY-CHAIRMAN proposed the re-election of the retiring Directors (Mr. A. F. Phillips and Mr. Samuel Cutler).

Mr. A. M. PADDON seconded the motion, which was cordially agreed to.

The CHAIRMAN, in acknowledging his re-election, remarked that, ever since he had been a member of the Board, he had been actuated by a desire to keep down the capital per million cubic feet of gas sold. If the proprietors looked through the records of the last ten years they would realize that in this respect the Board had been remarkably successful. While they had been doing this, the works had been almost entirely reconstructed; and they were now, he believed, in a most efficient condition. They were aiming at two things—the reduction of capital and efficient plant.

Mr. CUTLER also replied.

Moved by Mr. A. W. OKE, and seconded by Mr. W. RICHARDS, the retiring Auditor (Mr. James Randall) was re-elected.

Mr. PADDON, in moving a vote of thanks to the Engineer and Manager, his staff, and the employees generally, remarked that Mr. Chambers' share in looking after the interests of the Company on the works had been a large and onerous one; and it might in truth be said that the main burden of the past winter had been upon him. He had successfully discharged his duties, notwithstanding the winter had been more onerous in its exactions on the gas engineer and manager than any that had preceded it, by reason of the inclemency and the severity of the season and the atmosphere of difficulty engendered by the war. Mr. Chambers had therefore nothing of which to be afraid in anything that was before him. With the supervision of such an expert as Mr. Burton in the secretarial department, there would also be plain sailing there.

Mr. R. S. BATHE seconded the motion, which was heartily agreed to

A TRIBUTE TO THE LATE CHIEF.

Mr. CHAMBERS acknowledged the kind words that had been used, and the heartiness with which the vote had been passed. He said the half year had been a harder one than usual in consequence of the loss of their late friend, Mr. Chapman. The depth of winter was a hard time in the ordinary way; but Mr. Chapman's death coming then made them all feel his loss very greatly indeed. In speaking for himself, he should like to include all the staff and employees. Such results as they had that day could not be given without the cordial co-operation of their loyal workmen. He emphasized this fact, because, as the Manager realized, it was a great asset to the Company to have round him a staff of workmen doing their very best. The figure of 142 mentioned by the Chairman as the number of employees before the war was the summer number. In the last few weeks they had been meeting increases of output some days of 30 p.ct., with a staff and number of workmen much less than the ordinary summer number. This proved loyalty. He should have liked the proprietors to have seen—perhaps some of them did see—on that dreary day in December when they laid their good friend to rest (it was one of the worst days of the year, and the very elements seemed to be mourning with them), the men lining up the churchyard, and they would have recognized there a fine testimony of devotion to the late chief. It marked their feelings for him who had been so much to them in the past, He (Mr. Chambers) had confidence that the same loyalty would be shown to him. As Works Manager he had done in the past what he should try to do in the future; and he hoped to carry out the Directors' policy, which was a wise one.

Moved by Mr. OKE, and seconded by Mr. HAROLD FOSTER, a cordial vote of thanks was also passed to the Directors.

NORTH MIDDLESEX GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Monday of last week, at the Offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, M.Inst.C.E., the Chairman, presiding.

The SECRETARY (Mr. E. L. Burton, F.S.A.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought that, as the result of their examination of them, the proprietors would congratulate themselves that they were as satisfactory as was the case. If, as the accounts showed, the Company maintained their position fully, with a certain added measure of security with regard to the future, the Directors had done all that could reasonably be expected of them. The report stated that there had been a slight increase of business. Turning to the accounts, he might say that the capital now stood at £671 per million cubic feet of gas sold, which was a quite satisfactory figure. The sale of gas amounted to 13,496 c.ft. per ton of coal carbonized, which they would also agree was very satisfactory. As to the unaccounted-for gas and that used on the works, this came out at only 4·67 p.ct. The receipts from sales of gas and rentals were nearly £2000 more; but there was a slight decrease in the matter of residual products. The total increase in the way of gross receipts was £1910. On the other side, the increase in the cost of coal, oil, and coke was £1859, which was already accounted for by the extra receipts. Maintenance charges had been kept up to their full pre-war level, taking them together. Allowances to dependants serving with the forces were £940; and as 1d. per 1000 c.ft. represented £653, this was an important addition. The charges due to the war mounted up, in fact, until they reached an aggregate of £1557, or not far short of 3d. per 1000 c.ft. Notwithstanding this, however, the profit was £6335, which was an increase of £717. Adding interest on bank deposits £181, the amount fell short by only £231 of what they required. There had been added to the benefit fund account £184, and had a handsome balance to carry forward. Some extra provision in this regard was necessary, because when the war terminated and the men came back certain pledges which they had very properly made to them when they went would have to be fulfilled; and they would be met from this fund to a great extent. No doubt, the proprietors would feel the justifiable anxiety about the future which the Directors experienced, but which in the case of their Company was qualified by the fact that they were vastly better off than the majority of people. Their price was now 3s. 7d.

per 1000 c.ft.; and at the present time the Board did not see any reason why they should have to increase it. They had a good supply of coal; and they had been fortunate in their deliveries all through this troubled period. Further, they had an amount of oil stored which was a considerable guarantee for their operations in the future. Since the beginning of this year, the increase in business had been very important, and such as must make its mark on the accounts for the current six months. Labour, of course, gave great trouble. Out of the original force of something like 170 men, 90 had gone to serve their country. As far as possible, women were being engaged; and their employment had afforded the Directors a very agreeable surprise, both as to tractability and aptitude.

Mr. H. A. Lermitte seconded the motion, which was unanimously passed.

On the proposition of the Chairman, seconded by Mr. S. A. Sampson, dividends were declared for the half year, less income-tax, on the preference capital at the rate of 5 p.ct. per annum, on the original ordinary capital 11 p.ct. per annum, and on the additional ordinary capital £7 14s. p.ct. per annum.

Mr. A. F. Phillips proposed a vote of thanks to the officers and workmen; remarking that in the administration of the works their Engineer and Manager (Mr. Lawrie Trewby) had been most successful. In addition to the good make of gas, he had been very economical in his fuel consumption. In fact, he (the speaker) did not think they could find better results anywhere than those which had been obtained at the works of the North Middlesex Gas Company during the last six months.

The resolution was seconded by Mr. W. G. Beaumont, and cordially passed, as was also a similar vote to the Chairman and Directors, on the motion of Mr. C. H. Rutter.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Directors, in their report for the half year ended Dec. 31, expressed regret that an amendment of the Company's Act of Incorporation to grant power to raise increased capital, and by which an additional area of land for a new works site could be secured, has not so far been passed by Parliament. The difficulty which will shortly arise in meeting the increasing demands of the public for gas has been fully explained to Ministers; and urgent representations have been made to previous and the present Governments with a view to the pressing requirements being met, but, up to the present, without success.

The net profit for the six months was £103,534, or £6254 more than the sum earned in the January-June half. The Board proposed the payment of a dividend of 6s. 6d. per share, making 13 p.ct. for the twelve months. Other appropriations comprise £30,000 to the reserve fund, £5000 to the meter renewal fund, and £3000 to the gas-stoves, &c., account. The dividend will absorb £62,219, and the remainder, £3316, is to be added to the balance at the credit of the profit and loss, which will then amount to £57,472. Sales of gas yielded £356,158, and residual products £90,005. A year ago the respective figures were £332,338 and £77,848.

As compared with twelve months ago, the gross revenue was £35,978 more; but, on the other hand, expenditure was up £39,828, and interest charges £3290. Thus the net profit was less by £7140 than for Dec., 1915. The quantity of gas sold was 1656 million cubic feet, as compared with 1545 millions for the last half of 1915.

TYNEMOUTH GAS COMPANY.

The report adopted at the annual meeting of the Company last Tuesday recommended dividends at the rate of 4 p.ct. per annum on the preference stock and 5 p.ct. per annum on the consolidated and new ordinary stock, less income-tax. The number of ordinary and prepayment meters in use at Dec. 31 was 22,980. The Company have applied to the Board of Trade for a Calorific Standard Order.

The Chairman (Mr. J. B. Williamson) said the revenue for the past year was £96,540, and the expenditure £86,147, which left the sum of £10,393 as profit. If to this was added the balance of undivided profit from the previous year of £5214, there was an available sum of £15,607 to be dealt with. To pay the maximum dividend authorized would take £9979, and leave a balance to carry forward of £5628, thus increasing the amount forward by £414. The gas made during 1916 was less by 20 million cubic feet than that of the previous year, and was equal to a loss in revenue of about £2000. Outside lighting by gas had been absolutely abolished and the lighting of shops and other places of business had been seriously reduced. Although the quantity of gas sold was so much less than in the previous year, the revenue from gas was £62,808, against £62,250, an increase of £558. The quantity of coal carbonized was 46,564 tons, against 48,200 tons, or 1636 tons less; and it had cost less by £831. The gas made per ton of coal was practically the same as in the previous year, which was a record figure. The revenue from the sale of coke was £21,971, against £17,161, an increase of £4810. The residuals, taken together, yielded £29,145, against £26,787, an increase of £2358; and they had realized 12s. 6½d. of the cost of each ton of coal carbonized, equal to 98 p.ct. of the value of the coal. They now knew that there would be an advance in the price of coal of 4s. 2½d. per ton in the second half of the year. This would mean an additional cost of about £5000 on the year's work. To meet it the Directors had been compelled to increase the price of gas to ordinary consumers from 2s. 4d. to 2s. 6d. per 1000 c.ft. This was expected to raise about £3000. They did not propose to increase the price to the slot consumers at present.

The Welsbach Light Company's issue of shares has been largely over-subscribed. Letters of allotment and regret will, it is announced, be issued as soon as possible.

SUNDERLAND GAS COMPANY.

The Annual Meeting of the Company was held last Wednesday, at the Offices, Fawcett Street, Sunderland—Mr. T. W. Stuart presiding, in the absence of the Chairman.

The Acting-Chairman, moving the adoption of the reports and accounts, said the Chairman (Alderman S. Richardson) had prepared a speech, which he would read. The revenue from all sources had been £156,742, against £151,052 for the previous year, an increase of £5690. The expenditure, £137,597 against £127,552, was an increase of £10,045, but still left a profit of £19,144, which was more than sufficient to pay the dividend recommended. Coals had cost £10,311 more; but fortunately residuals had realized more by £11,077. Rates, taxes, and insurances showed an increase of £1887, which was almost entirely income-tax. The Directors were pleased that as yet they had not found it necessary to advance the price of gas beyond pre-war rates—a fact which consumers would appreciate. The gas made during the year under review showed a decrease of 2·47 p.ct.; and the decrease would have been still more marked, had it not been for the increased consumption of gas for power purposes, and its extended use for heating and cooking. Last year's report referred to the request of the Government for materials for the manufacture of all kinds of munitions of war. Since then, an additional plant had been erected, and was working satisfactorily. All this had entailed some little inconvenience to the Company's customers; but they had rightly realized the needs of the Government. Owing to shortage of labour and material, less urgent repairs and renewals were standing over for the present. The increased cost of living had been recognized from time to time by the payment of war bonuses. The Directors felt sure that the Company's contribution of £1000 to the War Hospital would meet with the approval of the shareholders. Nearly 50 p.ct. of the Company's employees had joined the Colours; and £1531 had been paid to their dependants during the war. Women were being employed in many departments, and generally gave satisfaction.

The report was adopted; and it was agreed to declare, in addition to the interim dividend paid in September last, a like dividend of 5 p.ct. on the original stock and 4½ p.ct. on the additional capital stock, less income-tax.

BLYTH GAS COMPANY.

The Litigation with the North-Eastern Railway Company.

The Annual Meeting of the Company was held at the Offices on Monday of last week—Mr. R. G. Dobson presiding.

The Chairman, in moving the adoption of the report [*ante*, p. 427], said it gave him the greatest satisfaction to be able to congratulate the stockholders upon the position of the Company at the conclusion of another year—a year teeming with unusual worries and anxieties. They were able to pay out of the profits the statutory dividend. In reviewing the accounts, he referred to an item of £615 charged in the profit and loss account as "N.E.R. Co. damage to permanent way." This, he explained, resulted through unsuccessful litigation with the Railway Company at the Newcastle Assizes, when the Gas Company were mulcted in damages and costs for damage done to the Railway Company's permanent way abutting upon the Gas Company's works, and caused, it was alleged, by negligence and trespass resulting in a fire. The Directors felt bound, in the interests of the proprietors, to challenge the claim, and were satisfied that they had done so, though the verdict was against them. The case was given an exhaustive and impartial hearing;* and the Judge arrived at his decision on the grounds of "nuisance"—being satisfied that there was no negligence attributable to the Gas Company in carrying out the work. Although stay of execution was granted, the Directors did not consider it wise to take the matter further; and this decision was arrived upon after due consultation with their engineers and legal advisers. The quantity of coal carbonized during the year under review was 11,416 tons, yielding in gas 128,339,000 c.ft., equal to 11,214 c.ft. per ton of coal. Coke sold equalled 9½ cwt. per ton of coal carbonized. The number of consumers on the books of the Company now reached a total of 8598.

Mr. A. C. Hovey (Newcastle) seconded the resolution, which was unanimously agreed to.

* A report of this case appeared in the "Journal" for July 4, 1916 [p. 30].—Ed. G. J.

Leicester Gas Profits.

Considerable satisfaction has been occasioned at Leicester that, despite the present difficult conditions, it has been found possible to allocate from the gas profits earned during the past year £5000 towards the relief of next year's rates. The profits have been little less than one-half those obtained in the preceding twelve months; the total cost of manufacture and distribution of gas, establishment charges, &c., having amounted to £170,606, compared with £149,390 in the previous period, leaving a balance to be carried to profit and loss account of £21,561, as against £43,567. After placing £16,850 to sinking fund account, the net profit for the past year was £9349, compared with £26,965 in 1915. The last half-year's working showed a balance of loss amounting to no less than £8004, as against a profit of £17,353 in the first half of the year; the reason for this being found in the greater cost of materials and the altogether larger expenditure always associated with the latter half of the year.

High Wycombe Gas Company.—The profit of the High Wycombe Gas Light and Coke Company, Ltd., for the half year ended Dec. 31 amounted to £1444; and with the sum brought forward, there was an available total of £4447. After paying the debenture and preference share interest, there remained a balance of £3943, out of which the Directors recommended the payment of dividends at the rate of 10 p.ct. per annum on the original shares, and 7 p.ct. per annum on the additional shares, leaving £3026 to be carried forward.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 12.

There is a fair amount of activity in pitch in the London market, and further business is reported. Makers' price to-day is not below 25s. per ton net in bulk at works. There is no change in the position of creosote; the demand for various purposes being steady. Solvent naphtha is unaltered at 2s. 2d. per gallon net and naked at makers' works.

Sulphate of ammonia continues to be rapidly taken up for the home market, and it rather looks as if in the neighbourhood of London the demand will be considerably in excess of the available supply.

Tar Products in the Provinces.

March 12.

There is nothing of particular importance to report concerning the market for tar products. The price of pitch remains the same. Solvent naphtha is quiet; while heavy naphtha keeps steady. Creosote is firm.

The average values of gas-works products during the week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11¼d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 3⅜d. to 4d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

Sulphate of Ammonia in the Provinces.

Liverpool, *March* 9

No alteration has taken place in the position since the last report; the export market having continued quite lifeless, and the fixed prices for home fertilizing having remained at £15 10s. per ton to mixers and distributors and £16 to agriculturists, net cash, in makers' bags, carriage paid to consumers' stations.

Nitrate of Soda.

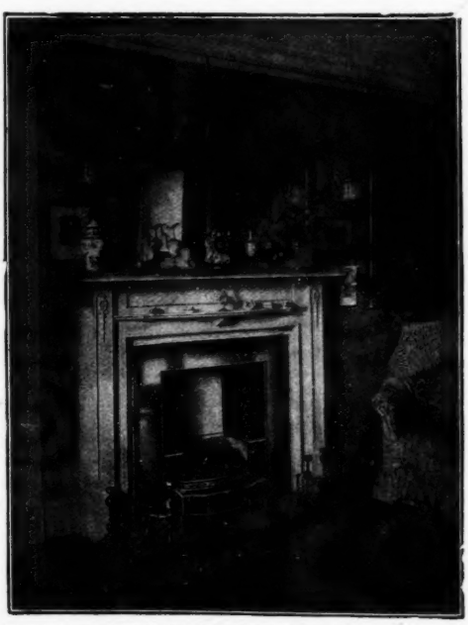
The tone of this market has continued very firm, and holders on spot now require 24s. per cwt. for ordinary quality and 24s. 3d. for refined.

COAL TRADE REPORT.

Northern Coal Trade.

The home consumption is fairly good; but exports are influenced by the lack of ready steamers, and by the large demand for some of the allied countries, at "controlled" prices. Where the collieries depend on export trade, some of them have been working short time of late. In steam coals best Northumbrians are quoted about 30s. per ton f.o.b.; for second-class steams the quotation is 21s. to 22s. 6d.; and for steam smalls from 17s. to 19s. 6d. is quoted. Although these are the current prices, there is some discounting of them when a vessel can take up a cargo with promptness. In the gas coal trade, the home demand is very good, but the exports are rather limited; so that some of the pits have worked rather irregularly. Best Durham gas coal is 25s. per ton f.o.b.; second-class qualities are from 17s. 6d. to 19s. 6d.; and for "Wear specials" the price is from 28s. to 30s. 6d. Contracts are still few; but some collieries have a fair tonnage on order, when steamers arrive. The local demand is good for Durham coals generally. The question of Government control and its extent is being slowly decided; and it has transpired that the dividends proposed for colliery companies have, before payment, to be notified to the Controller. The output of coals in the two Northern Counties, which decreased for about two years from the outbreak of war, has now shown a very slight tendency to increase. Gas coke is in good demand at from 31s. 6d. to 32s. 6d. per ton f.o.b., but the rates of freight thereon are firm at the high prices prevalent of late.

Cheshunt and Waltham Abbey Gas Company.—In the report presented at the recent meeting, the Directors stated that the accounts for the year ended Dec. 31 showed a profit of £4300. An interim dividend at the rate of 7½ p.ct. per annum on the "A" shares, and 5½ p.ct. on the "B," "C," and "D" shares, was paid for the half year ended June 30; and after providing for debenture and loan interest for the year, there remained a balance of £2357 to the credit of the net revenue account, out of which the Directors recommended the payment of a dividend for the half year ended Dec. 31 at the rate of 8 p.ct. per annum on the "A" shares, and 6 p.ct. on the "B," "C," and "D" shares, and that the balance of £415 be carried forward. In consequence of the considerably increased cost of coal, oil, &c., the Directors were compelled to increase the selling price of gas from Michaelmas quarter to 3s. 10d. per 1000 c.ft. for ordinary meters, and to 4s. 8d. for prepayment consumers. The increased sale of gas was derived chiefly from the requirements of the Government factories for war purposes. The sale of residuals had been satisfactory. Mr. W. B. Randall (the Secretary and Manager) said they had sold 13·7 p.ct. more gas during 1916. The gas made per ton of coal carbonized for the year amounted to 15,487 c.ft.; and that sold equalled 14,661 c.ft. per ton of coal. The total value of residuals per ton of coal showed an increase of 1s. 5·46d. over the year 1915.



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Hastings and St. Leonards Gas Company.

When submitting the accounts for the half year ended Dec. 31, the Directors of the Company reported that there was a profit balance of £9400, which, with £485 from the balance brought forward, would provide for standing charges and enable the statutory dividends to be paid. The full effect of the higher prices of coal and oil under new contracts had commenced to be felt. Coal was approximately twice, and oil three times, pre-war prices. Freightage, which was three times normal cost, was largely responsible for these advances. In these circumstances, the Directors had no other alternative but to advance the price of gas, as from the December readings of the meters, 3d. per 1000 c.ft. In December, the shortage of labour, with the increased demand for gas, became very acute. The supply of gas was only maintained with great difficulty and some unavoidable inconvenience to consumers. It was not possible, owing to war difficulties, to get completed as desired certain plant which was ordered to meet the labour difficulty. A benzol recovery plant had been put on order. In common with many other gas undertakings, the Company have made application to the Board of Trade for the substitution of a calorific standard for the standard of illuminating power, now generally discontinued. The Directors regretted to record that Mr. J. T. Piper, who was associated with the Company for 58 years, and who retired from active service in January, 1916, died on Dec. 19 last.

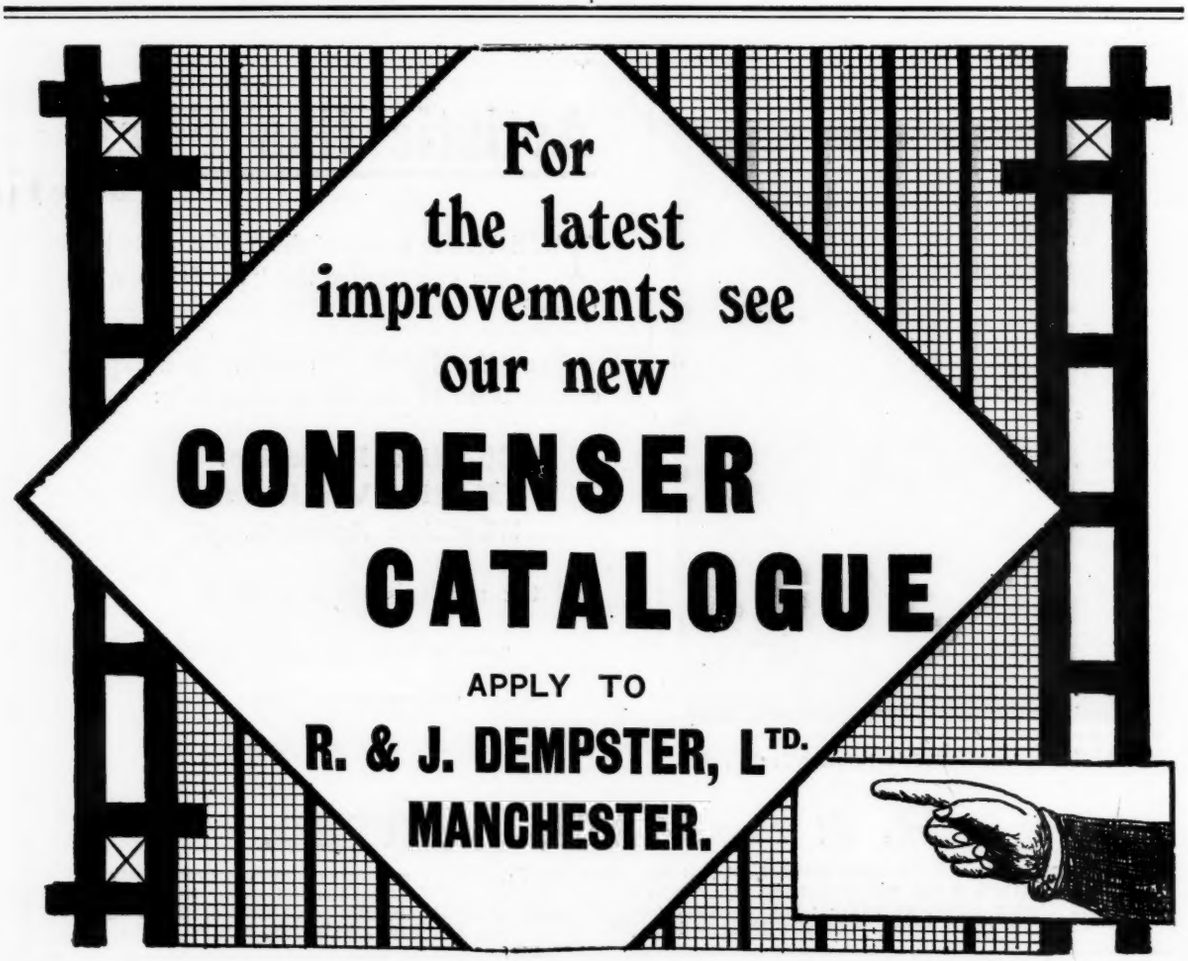
A Healthy Occupation.—For length of service on the directorate of gas undertakings, the gentlemen who retired from the Board of the York Company and were re-elected at the recent annual meeting will take some beating. Mr. W. W. Hargrove (the Senior Director) was appointed in 1879, and has thus served for 37⅞ years; while Mr. James Melrose and Mr. J. R. Hill, who were elected in 1883, have each served 34 years—an aggregate of 105⅞ years, which is believed to be a record for any similar undertaking. When it is remembered that Mr. Henry Preston, who died not very long ago in his 102nd year, was a former Director, there was every justification for the remark by Mr. Alfred Procter (the Chairman) that it is a very healthy occupation to be a member of the Board of the Company.

Salaries at Manchester.—The Manchester Gas Committee are proposing the following increases of salary: Mr. G. W. Tooley (Manager at the Rochdale Road station), from £425 to £450 per annum. Mr. W. Buckley (Manager of the Droylsden station), from £275 to £300 per annum (with house, &c.). Mr. W. Hawkyard (now Chemist at the Bradford Road works, to be appointed Assistant Works Superintendent there), from £156 to £200 per annum (with house, &c.). Mr. W. M. Barrett (Acting Manager of the Private Lighting Department), from £156 to £180 per annum, rising to £200. Mr. F. F. Mooney (now Assistant Chemist at Rochdale Road works, to be appointed Chemist), from £117 to £150 per annum, rising to £250. At Wednesday's meeting of the Council, the proposal was deferred for a fortnight.

Profits and Prices at Belfast.

In his statement on the Belfast Corporation estimates for the year ending March, 1918, Mr. Coates, the Chairman of the Finance Committee, said that from the Gas Committee they would receive (if earned) the same grants as in the previous year—viz., £11,400 for interest and sinking fund on the cost of the City Hall, and £10,000 to the general purposes fund; £21,400 in all. From the Electricity Department they were promised £5000. A formal resolution was passed by the Finance Committee ear-marking the amount indicated from the gas profits. At a meeting of the Corporation, Mr. J. D. Smith's, the Gas Manager's, report to the Gas Committee was read. He said he was satisfied they could not carry on under present conditions, and, in view of the increased charges and the reduction of income from ammoniacal liquor and tar under new contracts, he had no alternative but to recommend an increase in the price of gas. The rate to ordinary meter consumers should be raised to 2s. 11d. per 1000 c.ft., less the usual discount, making it 2s. 4d. net; for gas-engines, 2s. 6d., less 20 p.ct., equal to 2s. net; and the gas supplied through slot meters reduced to 30 c.ft. per penny, instead of 35 c.ft. as before. The new charges would realize about £40,000 per annum. The report was adopted, and the scale of prices indicated was approved; a motion to send the matter back for reconsideration being withdrawn after some discussion. Mr. Coates said to an extent the consumers were entitled to the profit; but when there was a certain amount of surplus, why should not the ratepayers get it for what they had done for the undertaking? Mr. M'Entee said it seemed unreasonable to increase the price of gas when the Gas Committee were giving large grants in aid of rates. Mr. Laughlin, the new Chairman of the Gas Committee, said it was not the desire of the Committee to increase prices if it could be avoided. There was, however, an increase in the oil contract of £17,000, in wages of £10,000, and in repairs of £6000. Materials were still going up; and they had lost £8000 on their residuals.

Gas v. Electricity at Todmorden.—At the last meeting of the Todmorden Town Council, a lively debate took place on a minute of the Finance Committee to the effect that a proposal to spend £10,000 on new plant for the electricity works be deferred for six months. Mr. Brook (the Chairman of the Electricity Committee) contended that the proposed new plant was absolutely necessary to bring the department up to date and supply power consumers. They must either do this or scrap the works altogether. Mr. Greenwood (the Chairman of the Gas Committee) strongly denounced the proposed expenditure. There was, he said, already an annual loss on electricity supply of £2000, and the new proposal would simply increase it. Put shortly, what the Electricity Committee now proposed was to sell at 1d. per unit current that cost them 2d. per unit to produce—a statement which could not be disproved. The proposal to defer the matter six months was, however, defeated.



Increase in Price of Gas at Tottenham.—The Directors of the Tottenham District Light, Heat, and Power Company much regret that, in consequence of the great and continuing advance in manufacturing costs, it is necessary to increase the price of gas 8d. per 1000 c.ft., as from Lady-day.

Shotley Bridge and Consett Gas Company.—The report adopted at the annual meeting stated that for the year ended Dec. 31 the revenue amounted to £18,053, and the expenditure was £14,409, leaving a profit of £3464. After providing interest on loans, there remained a sum of £3278, out of which the Directors recommended the payment of a dividend of 5 p.ct. per annum, less income-tax, including the interim dividend paid in August last. This left a balance of £288 to carry forward. The sale of gas showed a decrease of 5 p.ct. upon the previous year, which was chiefly due to the lighting restrictions throughout the district. In view of the increased cost of material and working expenses, the results, on the whole, might be considered satisfactory.

Woking District Gas Company.—The Chairman (Mr. C. H. Master, J.P.) said, at the half-yearly meeting of the Company, that he thought the proprietors might congratulate themselves that the undertaking had done so well. Thanks to good management, the expenses had been reduced; while the Consulting Engineer (Mr. A. F. Phillips) reported that the works and machinery were in better order than ever before. In fact, the position of the concern was better now than at any previous time in its history. The report stated that the receipts from the sale of gas showed a decrease of 4·84 p.ct., compared with the corresponding period of 1915. This was mainly owing to the extinction of nearly all the public lights; private consumers being responsible for a falling off of only 1·28 p.ct. After meeting the usual charges for interest, &c., there remained a disposable balance of £3700, out of which the Directors recommended the payment of a dividend at the rate of 5 p.ct. on the preference stock and 5½ p.ct. on the "A" and "B" ordinary stocks, which would leave £1961 to be carried forward.

British Coalite Company.—The consent of the debenture holders in the British Coalite Company, Ltd., is being sought to the granting of a licence to utilize the Company's low-temperature process within the United Kingdom. This licence will be subject to the one already granted to the Barnsley Smokeless Fuel Company, but will otherwise be an exclusive one. The licensees will be a new Company, with an issued capital of at least £50,000. The main terms of the proposed licence are that the Company will receive as part consideration for the granting of the licence the sum of £6000 during each of the years 1917, 1918, and 1919, and, in addition, a royalty of 1s. per ton for the first 2,000,000 tons of coal per annum treated by the process and 9d. per ton for quantities in excess of this amount, with a minimum royalty of £6000 per annum during each of the years 1918, 1919, and 1920. The licence will further provide that if the royalties for the year 1921 and subsequent years do not amount to £35,000, the Company, unless the licensees make up the deficiency, may terminate the licence. The licence will be for the duration of the patents.

Stockport Gas Department Wages.—The minutes of the Stockport Gas Committee, confirmed at last Wednesday's meeting of the Borough Council, showed that on Feb. 20 a letter was received from Mr. P. J. Tevenan (General Secretary of the Municipal Employees Association) stating that he was instructed by all grades of workmen in the gas-works (except carters) to make an application for a war bonus of 3s. per week, to be paid as from the date of the application (Feb. 16). It was resolved to refer the application to a Special Committee on War Bonuses, with the recommendation that it be referred to the Chief Industrial Commissioner's Department for settlement.

Manchester Gas Undertaking and the Rates.—A topic of considerable discussion among members of the Manchester City Council during the last few weeks has been whether the Trading Committees should continue to give the present yearly amounts for the relief of the local rates. For the last three years the contribution of the Gas Department has been £50,000 per annum, *plus* income-tax, or £62,500. The Lord Mayor (Alderman T. Smethurst, J.P.) presided last week over a meeting of the Special Committee who are considering the question; the suggestion being advanced by the spokesmen of the various departments that it would be impossible to give the same amount to the rates as in former years, unless the price of the commodity was raised. On the other hand, members of the Council who are not on the Special Committee consider that the trading departments should dip into their reserve funds, on the ground that to raise gas prices and car fares would be to burden thousands of people who already feel severely the strain of high food prices. Although the Committee did not arrive at a definite conclusion upon the matter, it is considered inevitable that the charges for gas will have to be reviewed after this month.

Contributions of Birmingham Trading Departments.—Presenting the report of the Finance Committee at last Tuesday's meeting of the Birmingham City Council, Alderman Williams proposed that the Council go into committee on the estimates for the borough rate for the ensuing year. He said that (including the loss of the tramways contribution of £50,000, and £2000 less by the Gas Committee) the actual net increased estimated expenditure was £82,441. The contribution from the trading departments was disappointing from the ratepayers' point of view, and it certainly would be from the point of view of an ordinary shareholder if they were limited liability concerns. The redeemed capital of £2,248,102 had been directly subscribed by the citizens out of the profits earned in years past; and the amount would continue to increase. For this they only received this year £51,000. Surely they ought to have more than that; and he suggested to the trading committees that they might very well consider whether the time had not come when they might give considerably more year by year. He ventured to suggest that 6 p.ct. upon this two millions would be a fair contribution; and whether it was contributed by one trading department or by all, the amount given to the rates should never be less than 6 p.ct. It should be a constant minimum sum.

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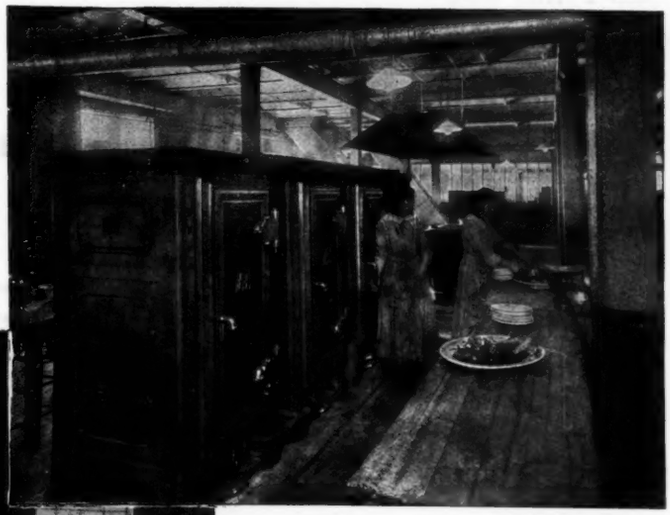

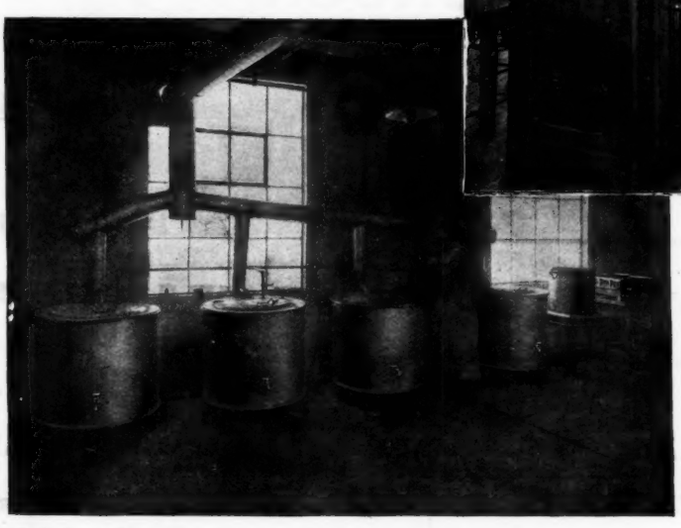

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Coal Contracts and Railway Carriage.

The Controller of Coal Mines has sent a letter to coalowners, factors, and merchants, pointing out the necessity for refraining at present from making forward contracts for longer periods than three months. The letter says it is becoming urgently necessary that special efforts should be made to relieve the congestion of transport on the railways; and with this in view the need for limiting the scope of future commitments will be obvious to all concerned. The Controller takes the opportunity of reminding coalowners, factors, and merchants that, in the national interest, great benefit would result from sustained efforts to ensure that all descriptions of coal be purchased from collieries situated as near as possible to the consuming points, thus securing the minimum of haulage and resultant economy in the use of both wagons and locomotives. While it is recognized that this may prevent some consumers obtaining the class of coals usually sought for, it is suggested that in many cases the effect of such changes would not necessarily act adversely on the operations for which the coal is required. The Controller feels assured that all concerned will appreciate the need for carefully weighing the conditions imposed upon the trade by reason of the war, and that he may rely upon the whole problem being approached by traders rather from the point of view of the national interest than that of adherence to commercial methods governing procedure in times of peace.

Successful Year at Ilfracombe.—In spite of the many difficulties caused by the war, the Ilfracombe Gas Company have had a very successful year. The Directors were able to announce at the annual meeting last Tuesday that the price of gas—which was advanced last June to 3s. 9d. per 1000 c.ft.—has been reduced, as from Jan. 1, to 3s. 6d. In moving the adoption of the report and balance-sheet, the Chairman (Mr. W. C. Rafarel) remarked that most of their coal came from South Wales, and the Company had to pay not only the 4s. per ton increase fixed by the Coal Prices Limitation Act, but the further increase of 2s. 6d. granted to the South Wales owners. In the opinion of the Directors this was distinctly unfair, as South Wales was the only coalfield in which this increase was allowed. Mr. R. M. Rowe, one of the Directors, referred to a comparison which had been drawn between the price of coal at Ilfracombe (18s. 4d. per ton) and Barnstaple (26s. per ton), and contended that the true test of the working of a gas company was its manufacturing results and the price at which gas and coke could be sold to local consumers. For nearly two years the Ilfracombe Company charged the pre-war price for gas, and they had charged only 18s. per ton for coke. They had made their full statutory dividend, and the consumers had had the advantage of the low prices. Testimony was borne to the arduous and devoted services of Mr. J. Armstrong, the Engineer and Manager, Mr. A. Norman, the Secretary, and their respective staffs; and they were cordially thanked.

Alliance and Dublin Consumers' Gas Company.—The Directors have decided to recommend a dividend at the rate of 5½ p.ct. per annum (the same as last year). A sum of £10,497 is to be withdrawn from the reserve for the purpose.

Strabane Gas Undertaking.—At a meeting of the Strabane Urban Council, Mr. James White, J.P., mentioned that there was a balance of £300 or £400 on the wrong side in regard to the gas undertaking; and, at his request, it was decided to have prepared for the Auditor a statement showing the present and pre-war prices of gas in the principal Ulster towns, in order that a comparison might be made with the price in Strabane.

Waste Heat and Gas Electrical Generating Stations, Ltd.—The report of this Company states that the profits earned last year, after deducting administration expenses, amount to £40,080, less £11,500 which the Directors have transferred to reserve, leaving £28,580. Adding the balance brought forward, the sum available is £45,510. The Directors propose a dividend at the rate of 8 p.ct. for the year ended Jan. 31 last. The revenue from units generated at the different power stations has been satisfactorily maintained; the amount of waste heat and gas having been approximately the same as during the previous year, but still below the average obtained prior to the war.

Hackney "Undue Preference" Litigation.—The Stockport Town Council last Wednesday re-affirmed their decision not to contribute to the costs of the Hackney Borough Council in respect of the pending action brought against them by the Gas Light and Coke Company for alleged undue preference in supplying electrical energy for lighting purposes at reduced charges to consumers who also used energy for power purposes. A letter from the Acting Town Clerk of Hackney stated that it had been decided to request contributions on the basis of £1 for every £1000, or part thereof, of gross revenue, computed from the returns for 1915, with a maximum contribution of £100 and a minimum of £5.

Price of Gas at Silsden.—Last week the price of gas was advanced by the Silsden Urban District Council from 2s. 6d. to 2s. 11d. per 1000 c.ft. This is the first advance since the outbreak of the war. The gas undertaking of the township has been remarkably successful for a number of years past; and the controllers have proudly claimed, until the new change, that Silsden has been supplying gas at a cheaper rate than any other town of similar size in the United Kingdom. The increase is due to advanced expenditure—particularly on coal and repairs—and the fact that, despite an increased income of about £100 from coke and other residuals, there is an estimated loss of something like £320 on the present year's working. The Silsden Gas-Works were constructed in 1903, commencing operations in April, 1904, prior to which the township obtained gas in bulk from the Kildwick Gas Company. The first charge under the Silsden Council was 3s. 9d. per 1000 c.ft.; and while a good deal of money has been spent on enlarging and improving the plant, £3461 has been contributed to relief of rates in the twelve years.

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Control of Coal Mines.—At last Wednesday's meeting of the Salford Town Council, the following minute, passed by the Gas Committee at their meeting on Feb. 15, was unanimously confirmed: "That, in view of the great importance to coal consumers of obtaining adequate supplies of coal, the Board of Trade be strongly urged to take into consideration the advisability of appointing representatives of coal consumers upon the Advisory Committee which is to be appointed to assist the new Department about to be set up for the Control of Coal Mines; that a copy of the resolution be forwarded to the President of the Board of Trade and to the National Gas Council; and that such Council be urged also to approach the Board of Trade upon the matter."

Disappointing Result at Dover.—Recommending to the proprietors the payment of the statutory dividend of 7½ p ct. (less income-tax), which will necessitate drawing from the undivided profits the sum of £2246, leaving a balance to be carried forward of £3274, the Directors of the Dover Gas Company, in presenting the accounts for the half year ended Dec. 31, say they regret the disappointing result, which has arisen entirely through the high price of coal and the difficulties and increasing cost of transport and labour. They cannot see any sign of improvement in the near future in the difficulties of getting suitable coal and in the enhanced cost of freight and labour, and are now faced with the necessity of increasing the cost of gas to the consumers, which will be done as from the next reading of the indices of the meters. The Directors refer with the greatest regret to the illness of the Chairman (Mr. Willsher Mannering), whose services to the Company, it is remarked, have been of such long duration and inestimable value. They are, however, pleased to say he is now on the way to recovery.

At the annual meeting of the Redcar, Saltburn, and Marske Gas Company last week, dividends of 9 and £6 6s. p.ct. were approved, leaving £367 to be carried forward.

The Bolton Corporation are applying to the Local Government Board for sanction to borrow £4750 for the purpose of installing a benzol recovery plant at the Gas Street works, and also for sanction to borrow £2100 for the installation of a plant for producing concentrated ammonia at the Lum Street works.

At the meeting to-morrow of John Wright and Eagle Range, Limited, the Directors will present the balance-sheet of the Company as on Dec. 31 last. The balance of the revenue account for the year (after making provision for contingencies and internal reserves), including £12,002 brought forward, is £69 007. After deducting the interim dividends (£18,120) paid in August last, there remains at disposal the sum of £50,887, which the Directors recommend be appropriated as follows: Dividend at the rate of 6 p.ct. per annum for the half year on the preference shares, less income-tax, £1912; a dividend of 1s. 6¾d. per share on the ordinary shares (including the new issue), free of income-tax, £26,800; reserve fund, £10,000; and carry forward, £12,175.

The Halifax Corporation have contracted with Messrs. R. & J. Dempster, Ltd., for the erection of a benzol plant at the gas-works at a cost of £1995.

The Bridlington Town Council have decided to grant a war bonus of 10 p ct. on the present salaries of all officials and employees of the Council who have not received the war bonus granted to other employees, and whose annual salaries are less than £150—the bonus to be retrospective to Jan. 1 last.

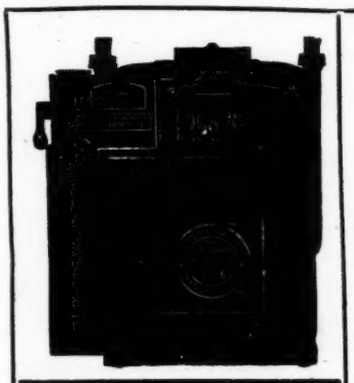
It was stated by the Chairman (Mr. J. Dewrance), at the meeting of the Deal and Walmer Coalfield, Ltd., that the Board had been in negotiation with a group who wished to acquire the whole of the Kentish coalfield; their object being not to supply coal, but rather to sell the various distilled products.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Mar. 7.]

Nos. 2761—3192.

ARTHURLIE ENGINEERING COMPANY.—"Gas-fired torch." No. 2951.
AUGUSTINE, B. F.—"Rotary gas engines." No. 2995.
CASBON, W.—"Inverted incandescent gas-burners." No. 2972.
CHILLINGTON TOOL COMPANY.—"Gas and air mixing appliances of the injector type." No. 3033.
CREASEY, H. H.—"Heating and drying." No. 3053.
DOCKING, A.—"Apparatus for supplying mixture of gas and air, &c." No. 2950.
DUNKINSON, A. J.—See Casbon. No. 2972.
FAWKE, E. J.—"Purification of phenols, amines, carboxylic acids, &c." No. 3029.
FAWKE, E. J.—"Distilling or evaporating liquids." No. 3030.
FLICKER, H.—"Purification of sewage, and production of combustible gas therefrom." No. 2893.
GRIFFITHS, H.—See Fawke. Nos. 3029, 3030.
HEENAN, H., and HEENAN & FROUDE.—"Control valves for gas mains, &c." No. 2936.
HELPS, G.—"Utilization and combustion of fuel." No. 3042.
HINMAN, C. W. & W. H.—"Gas-meters." No. 2843.
LIGHTS OF LONDON, LTD.—See Docking. No. 2950.
MAYER, J.—See Arthurlie Engineering Company. No. 2951.
NETTLETON, L.—See Chillington Tool Company. No. 3033.
PARKINSON STOVE COMPANY.—"Atmospheric gas-burners." No. 2935.
ROSE, J. R.—"Process of manufacturing gaseous fuel." No. 2983.
TAYLOR, R. C.—"Sublimation of naphthalene." No. 3104.
THOMPSON, J. A.—See Parkinson Stove Company. No. 2935.
VERE, M. C.—See Creasey. No. 3053.
WOOD, J. G.—"Prepayment gas-meters." No. 2948.



The "Positive"

"THE METER OF MANY MERITS."

SAWER & PURVES, BRANCH OF METERS LTD.

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

Agent for Scotland: JNO. D. GIBSON, 2, CAUSEYSIDE STREET, PAISLEY.

STOCK MARKET REPORT.

THE quietude that has settled down on the Stock Exchange was, if anything, intensified last week, and the House was almost the abode of peace and rest. Members might well be excused if in their inmost minds they regarded this state of things rather ruefully; but they are courageous and patriotic men, and accordingly they devoted their enforced leisure to addressing envelopes for Mr. Neville Chamberlain. Meanwhile, perhaps they were not losing count of openings to widen the field of business, among which were prospective dealings in the new War Loan. Already outsiders who are not precluded from advertising are on the warpath; and the House chafes at its enforced disabilities. More may be heard about this in connection with the Committee Election, which takes place this day week.

In spite of the restricted volume of business, the general tone was decidedly good, and the gilt-edged market was again to the front. The old War Loan was in excellent demand, and Colonial issues were firm, but Consols not uniformly so. Home Rails were very quiet—stock of all kinds being scarce. But they were strong, especially prior charges. Not much was done in Americans, and movements were irregular, actuated apparently by financial rather than political factors. Argentines improved in favour. South Africans were rather neglected. The Foreign Market had some bright points. Scandinavian and some of the most prominent of the South American issues were in good demand; Russian and Chinese were steady; and French closed firmer. Rubber and Oil did well; but not much else was prominent among the Miscellaneous.

Business in the Gas Market showed no improvement in point of volume; the aggregate of bargains recorded being about on a par with the scale of the week before. Changes in marked prices were not abundant, and were, on the whole, in the direction of greater ease. Variations in quotation were mostly in issues of the Metropolitan companies.

In the Money Market, rates were easy alike for short loans and for discount. A reduction in the Bank rate was half expected on Thursday; but it did not materialize.

Bargains done for cash during the week were as follows: On Monday, European 9½, Gas Light ordinary 65, 65⅛, 67¾, 67⅞, 68, ditto preference 68⅝, ditto debenture 55, Primitiva preference 60s. On Tuesday, British 34⅛, Continental Union 36, Gas Light maximum 55¼, 55⅛, ditto debenture 54¾. Imperial Continental 69, ditto debenture 58. On Wednesday, Bombay 5, British 33 13/16, 34 1/16, Continental Union 36, Gas Light ordinary 64⅛, 64⅜, 65, 65¼, ditto maximum 55⅛, ditto debenture 55, Imperial Continental 70, ditto debenture 58, South Metropolitan 73¾, 74, 74⅜, 74½, ditto debenture 56. On Thursday, Bournemouth preference 9 9/16, 9 11/16, 9⅝, Commercial 4 p.ct. 71, European 9¼, Gas Light ordinary 64½, 65, 65¼, 65½, ditto preference 68⅛, 68½, Imperial Continental 67, South Metropolitan 74⅛, 74¼. On Friday, Gas Light ordinary 64¼, Imperial Continental debenture 59¾, Metropolitan of Melbourne 98½, 98⅝, 98⅞. On Saturday, Gas Light ordinary 65⅛, 65¼, 65⅜, ditto preference 68⅛, Liverpool 81½, South Metropolitan debenture 55.

The Bank rate is 5½ p.ct., as fixed on the 18th of January.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	61–65	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59–64	62–64	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76–79	58–63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞–6⅛	4⅜–5⅛	5
50,000	10	Feb. 26	16	15/-		29–30	25–27	..
393,110	10	,,	7	7/-	Bournemouth Gas and Water { 10 p.c.	15–15½	11–11½	..
115,000	10	,,	6	6/.	B 7 p.c. Pref. 6 p.c.	13½–14	9½–10	9 9/16–9⅝
159,740	—	—	—	4%	4 p.c. Deb.	..	71–73	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261–266	83–85	..
734,920	,,	,,	11	53/9	Do. B New	204–209	80–83	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109–111	83–88	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91–93	67–69	..
217,380	,,	Feb. 26	11	10⅞†	Brighton & Hove Orig.	208–213	160–165	..
244,200	,,	,,	8	7⅞†	Do. A Ord. Stk.	154–159	115–120	..
530,000	20	Mar. 26	12½	22/6	British	44–45	33⅛–34½	33⅛–34½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88–90	66–68	..
215,771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85–87	57–60	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½–2½	1⅛–1⅜	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4–6	4½–5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70–75	58–63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108–110	79½–80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106–108	71–73	71
560,000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103–105	61–68	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½–71½	52–54	..
600,000	,,	,,	4	—	Continental Union Ltd.	76–79	35–38	36
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115–118	58–60	..
278,400	,,	,,	—	11¼%	Croydon B and C 7 p.c.	..	175–185	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅛%†	Derby Con. Stk.	123–125	100–105	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102–104	80–83	..
1,032,180	10	July 29	10	7/6	European, Ltd.	17½–18	9½–10½	9½–9⅝
16,313,430	Stk	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord.	98–102	64–66*	61½–65
2,600,000	,,	,,	3½	3½%	3½ p.c. max.	76–79	54–57*	55½–55⅝
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96–99	67–69	68⅝–68⅝
4,674,850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½–74½	54–56	54⅜–55
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
2 8,740	,,	Mar. 12	5	4⅛%†	Hastings & St. L. 3½ p.c.	87–89	78–83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½–16⅝	8–9	..
26,600	—	—	—	9⅛%	Hornsey 7 p.c.	..	125–135	..
131,000	Stk.	Mar. 12	7⅞	7⅜%	Ilford A and C.	151–154	105–110	..
65,780	,,	,,	6⅛	5⅞%	Do. B	115–118	82–87	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb	92–94	71–74	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150–160	68–73	69–70
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84–86	58–61	58–59¾
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119–121	87–92	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211–213	81–83	81½
					{ B	146–148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72–74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛–4⅜	3⅞–4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99–101	99–100	98⅛–98⅞
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11⅛–12	8–8½	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½–99½	73½–74½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82–83	73–75	..
55,940	10	Feb. 26	7 14/0	7⅞†	North Middlesex 7 p.c.	14–15	10½–11½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117–122	105–107	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½–7⅞	2–3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B	128–131	92–97	..
100,000	50	,,	12	11%	Do. C	118–121	85–90	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛–6	1⅞–2⅛	..
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅜–5	55.–65/-	60/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91–93	78–80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85–87	61–67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10⅛–11	8–8½	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47–49	42–44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223–224	188–192	..
209,984	,,	,,	10	10%	Do. B	223–224	188–192	..
523 500	,,	,,	10	10%	Do. C	220–222	188–190	..
90,000	10	May 28	9	6/-	South African	10⅜–11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8†	South Met. 4 p.c. Ord.	111–113	73–75*	73¾–74½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½–74½	54–56	56
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157–159	144–146	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114–116	80–82	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110–112	79–81	..
135.000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116–118	88–90	..
647,740	,,	May 14	5	5%	Southampton Ord.	99–102	77–79	..
120.000	,,	Feb. 12	7½	7⅛%	Tottenham { A 5 p.c.	135–138	95–100	..
782,275	,,	,,	6	5⅝%	District { B 3½ p.c.	115–117	68–73	..
181 255	,,	June 26	4	4%	4 p.c. Deb.	87–89	65–67	..
182.380	10	Dec. 30	5	—	Tuscan, Ltd.	5–6	1–2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93–95	60–65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½–109½	91–92	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	80/-†	Wandsworth A 5 p.c.	151–156	117–122	..
235 646	,,	,,	6½	65/-†	Do. B 3½ p.c.	129–134	101–103	..
108 075	,,	,,	5/17/3	56/-†	Do. C 3½ p.c.	110–115	88–93	..
352,000	,,	,,	6½	58/9†	Wimbledon 5 p.c.	117–122	90–95	..
98,000	,,	,,	6⅜	65/-†	Epsom 5 p.c.	121–126	98–103	..
88 416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66–69	51–54	..

* Ex. div. † Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

TECHNICAL AND COMMERCIAL MANAGER. Newark Gas Company. Applications by March 29.

METER TESTERS. Middlesex County Council.

YOUNG MAN (Chemistry and Drawing). No. 6291.

WORKS FOREMAN. Walsall Gas-Works. Applications by March 19.

GAS FITTER. Newtown (Mon.) Urban District Council.

Trading With the Enemy Act Sale.

BRITISH INCANDESCENT MANTLE WORKS. Tenders by March 19. Particulars and orders to view of Wheatley Kirk, Price, and Co., 46, Watling Street, E.C.

Wanted.

PITCH COKE. No. 6276.

Plant, &c. (Second Hand) Wanted.

GASHOLDERS. Heron Rogers and Dehn, Westminster.

Meeting.

BRITISH GAS LIGHT COMPANY. 11, George Yard, Lombard Street, E.C. March 28, Twelve o'clock.

TENDERS FOR

Coal.

BIRKENHEAD CORPORATION. Tenders by April 3.

General Stores (Brass and Copper Goods, Ironmongery, Sulphuric Acid, Lead Pipes, Shovels, Forks, Buckets, Screws, Bolts, &c., &c.

NELSON GAS DEPARTMENT. Tenders by March 16.
WIGAN GAS DEPARTMENT. Tenders by March 19.

Pipes, &c.

WIGAN GAS DEPARTMENT. Tenders by March 19.

Tar.

NELSON GAS DEPARTMENT. Tenders by March 16.
WIGAN GAS DEPARTMENT. Tenders by March 19.

Xylol.

Offers to No. 6290.